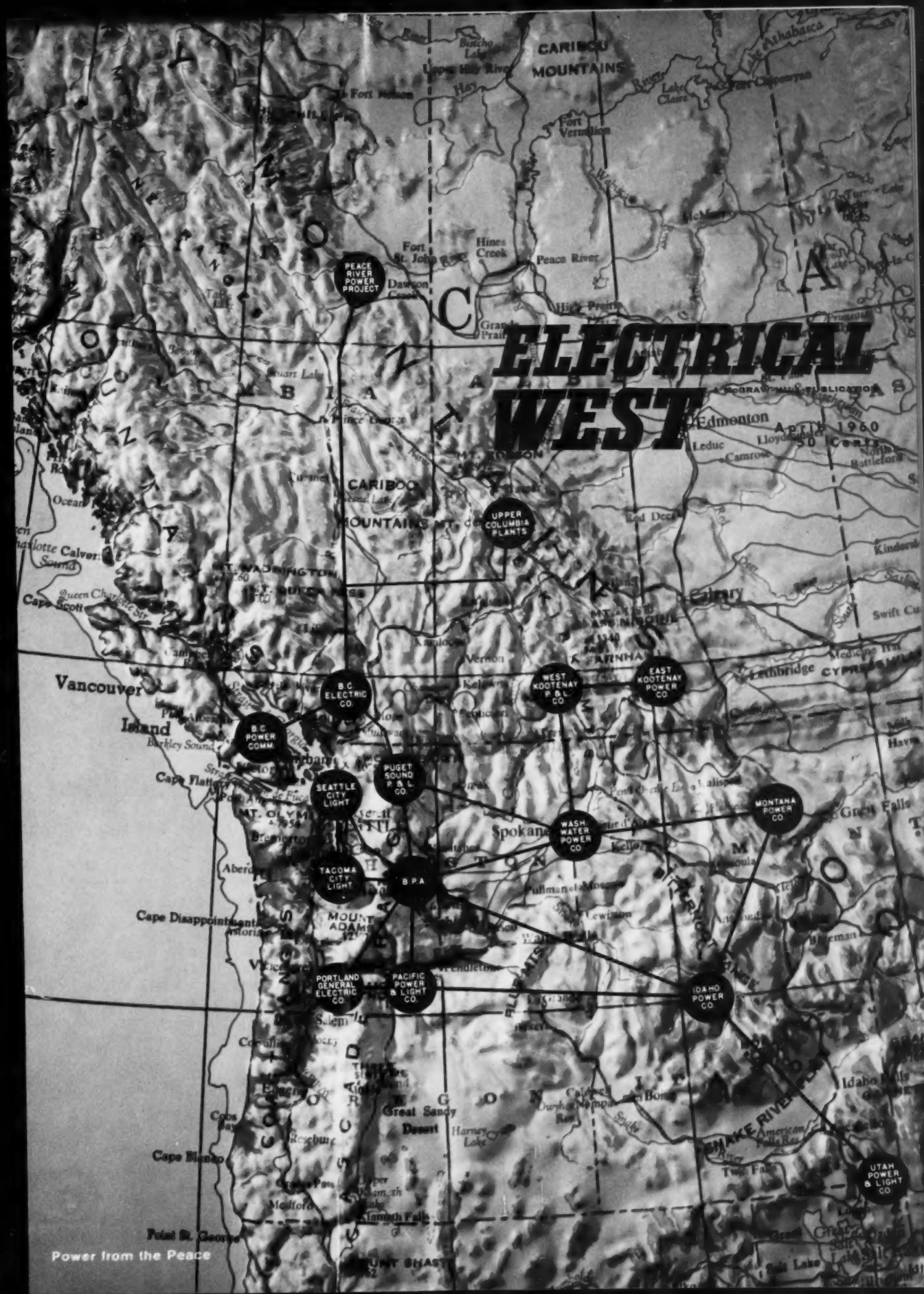
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APRIL 1960
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Power from the Peace

the KUHLMAN 60

INTRODUCING THE

ALL NEW QUICK GRIP

The transformer bushing that reduces radio noise without oil

The new Kuhlman "Quick Grip" H. V. bushing offers revolutionary, positive reduction of radio interference. No oil is needed even at higher voltages. The bushing shank fits into a stress relieving ground sleeve normally used only with power transformer bushings. The sleeve's surface prevents any concentration of stresses that could cause radio noise.

Get complete facts about ALL NEW revolutionary "Quick-Grip" from your local Kuhlman representative.

AND HERE ARE MORE OUTSTANDING FEATURES:

1. **A new protective hand grip**—permits line connections without use of tools . . . gives full protection against service interruptions caused by birds and animals coming in contact with live parts.

2. **New conductor capacity**—with spring loaded terminal, accommodates a wider range of aluminum conductors as well as copper.

3. **New porcelain construction**—with heavier, sturdier skirts, provides ample creepage with less chance of breakage.

4. **New internal clamping**—eliminates all external hardware. The same stress relieving ground sleeve does the clamping. Its simple one-piece construction evenly distributes mechanical stress along the bushing shank and threads into the transformer cover, not the bushing.

5. **New Quick Disconnect**—disconnects the bushing without the use of tools. A simple quarter turn of the disconnect at the base of the bushing disengages the bushing lead, leaving the cover or bushing free for removal.

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Manufacturers of transformers since 1894

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Mrs. Moriarty— It may not be many years before a high percentage of new residential telephone services are underground. Test installations are confirming early beliefs that savings in overhead plant will nearly offset excavation costs. Operating costs may go down. Service will probably improve.

This leaves us up on the pole by ourselves.

Our position may not be entirely pleasing to Mrs. Moriarty or any of her coffee-clatching neighbors. She won't understand the fact that *power* underground costs much more than overhead. She will see only that the telephone company did it and it didn't cost any extra either. The industry could lose friends trying to hold down the cost of power. Pad-mounted transformers, prefabed vaults, new kinds of conduit and new cables will cut the cost. More experience will cut the cost. Joint approaches such as placing the telephone and power cables together in the same trench will reduce costs. But extra costs for underground will be with us for a long time.

Some years ago G-E's Lem Boulware made a point. He said that the simple fact of *serving* the people was not sufficient. They had to be served in *the way* people wanted to be served. Henry Ford learned this lesson when he refused to paint the famous Model T any color but black—and Chrysler learned it again in the early '50s. Boulware believes people will pay to get things "their way."

Ultimately we will have to go along. And the route may not be too bad if we square up to the task. It will take some new rates, some promotion to gain understanding and some new technical approaches, but most important, an attitude that this is just another one of the problems involved in serving Mrs. Moriarty—and we haven't been stopped yet.

Campus Research—Many of the country's finest engineering schools have adopted major programs for graduate student research. It's a multimillion-dollar business.

At best, this is a method of siphoning money into our educational system and at the same time making available some constructive employment for graduate students. Also it would seem to bring industry closer in touch with education.

Detractors say it will also siphon some of the best graduate students into the fields that sponsor research. The greatest pitfall is that it will tend to direct the academic thought of the institution. Professors are human too. (See Roundup p 5).

With a continuing shortage of engineering personnel the utility industry may find it prudent to join the trend even though we may not be enthusiastic.

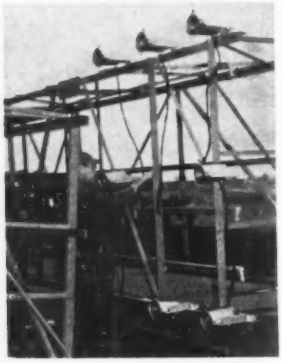
Conscientious and Fair—The Western industry can well take note of the conscientious and fair manner in which BPA Administrator Dr. William A. Pearl has conducted the Bonneville-California intertie proceedings.

In a simple effort to run his office efficiently he has become the center of a political issue where empire rather than efficiency is all-important. A man of lesser stature could have found many easy ways to "go along with the political tide."

While the issue stays in political limbo, Dr. Pearl's BPA is losing an estimated $2,000,000 per year.

Dr. Pearl has proved that sound principles of engineering and accounting can function independently of "public" or "private" labels. Our congratulations.

Power From the Peace—69



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A Conference Huddle—85

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S. Established 1887

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The Cover

Location of BC's Peace River development and tie in with other Northwest systems. Reproduced for the first time, the map is a portion of new relief map of North America produced and copyrighted 1960 by Aero Service Corp. (See photo top of page.)

Electrical West (with which is consolidated The Journal of Electricity), April 1960, Vol. 124, No. 4. Published semimonthly except November when published trimonthly by McGraw-Hill Company of California, James H. McGraw (1860-1948) Founder. Office of publication, 235 N.W. Park Ave., Portland 9, Ore. See panel below for directions regarding subscriptions or change of address.

Executive, editorial, circulation and advertising offices: 68 Post St., San Francisco 4, Calif. Donald C. McGraw, chairman of the board; George C. Tenney, president; John W. Otterson, vice-president; Thomas H. Carmody, secretary and treasurer.

Position and company connection must be indicated on subscription orders. Send to address shown in panel below. Subscription price includes the regular monthly issue, the news letter issue and the November directory issue. United States subscription rate $3 a year, single copies 50c (November directory issue $1); Latin American Republics and Philippine Islands $4 a year; Canada $3.50 a year; all other countries $4 a year. Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Printed in U. S. A. Title registered in U. S. Patent Office.

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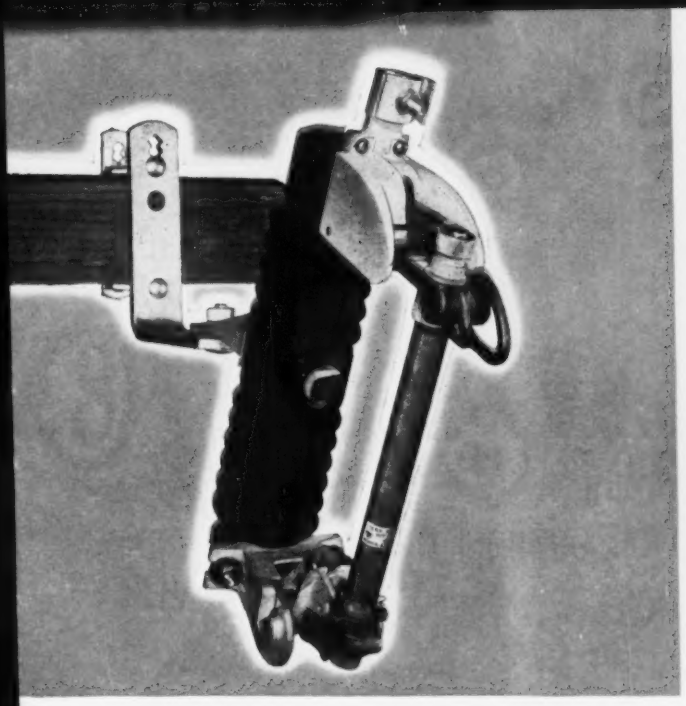
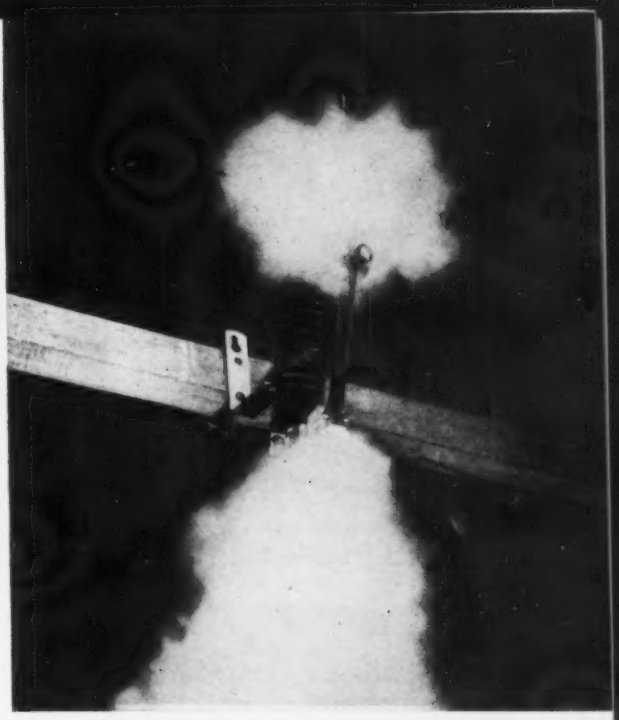


LINE MATERIAL concentrates all engineering, testing and manufacturing efforts in one direction—*highest quality equipment for the electric power industry.* And L-M came to you to find what you wanted in the best possible open type fuse cutout. The New LMO incorporates every important feature you asked for.



A 240,000 kva TEST on a 15 kv 100 ampere Type LMO Distribution Cutout at L-M's Thomas A. Edison Short Circuit Laboratory. This cutout repeatedly interrupts 16,000 ampere faults. Many tests like this prove the LMO cutout *Totally Tested* under all possible operating conditions.

This New Totally Tested Distribution Cutout Has All Features Electric Utilities Wanted

Drawing upon its more than 35 years experience in the engineering, testing and manufacture of distribution fuse cutouts, L-M has produced the new Type LMO open type fuse cutout.

Totally Tested in L-M's Thomas A. Edison Short Circuit Laboratory at Franksville, Wisconsin, with hundreds of tests, the new Type LMO has proved reliability, proved interrupting capacity and proved safety through its entire operating range.

The new Type LMO distribution fuse cutout has all the important features you asked for. Features heading the list:

1. Non-ferrous construction
2. Positive latching
3. High interrupting capacity
4. Rugged multiple contacts
5. Complete birdproofing
6. Choice of terminals—aluminum or bronze
7. Spring loaded interlocking flipper

Get Complete Information. Ask your Field Engineer to show you: the sample of the new Type LMO cutout; the Type LMO Bulletin No. FC3; the Type LMO Movie. Contact your L-M Field Engineer or write Line Material Industries, Milwaukee 1, Wis. In Canada: CLM Industries, McGraw-Edison (Canada) Ltd., Toronto 13, Can.

TYPE LMO RATINGS

VOLTAGE RATING KV	CURRENT RATING AMPS	INTERRUPTING CAPACITY AMPERES—ASYMMETRICAL			
		HEAVY-DUTY		EXTRA-HEAVY-DUTY	
		Non-Expendable Cap	Expendable Cap	Non-Expendable Cap	Expendable Cap
7.8	100	5000	10000	10000	20000
15	100	4000	8000	8000	16000
27	100	3000	6000	—	—

Interchangeable Fuseholders: ratings may be changed simply by changing the fuseholder. Choice of heavy-duty or extra-heavy-duty fuseholders; 200-ampere disconnecting blade; link-break fuseholder. This interchangeability offers convenience and savings in labor, material, and stocking costs.

LINE MATERIAL Industries

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SPECIALISTS IN DISTRIBUTION EQUIPMENT

434

DISTRIBUTION TRANSFORMERS · RECLOSERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING · LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE & CONDUIT

NOW

Alcoa aluminum patented integral web channel bus available in 8 sizes

You can now get **all** the advantages of aluminum integral web channel bus in a new broad range of sizes.

This patented* design, introduced by Alcoa in 1956, has been expanded to eight sizes, providing capacities from 2,800 to 12,000 amperes.

The web construction provides an integral shape for a bus conductor having unusual mechanical strength and high electrical efficiency. The large section modulus offers high structural strength to resist external loading and short-circuit stresses. The economical disposition of metal provides high current-carrying capacity at a low cost.

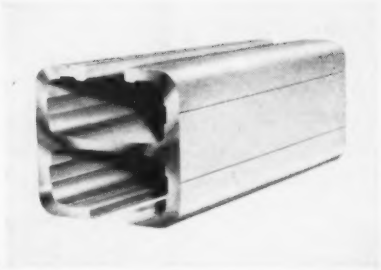
Moreover, you can make joints, taps, and splices by clamping, bolting, or welding. The table shows the sizes, capacities and weights from which you can choose to meet your exact needs.

Additional sizes can be designed to meet other specific needs. For complete information, contact your Rome representative. Or, if you'd like a copy of our "Alcoa Aluminum Bus Conductor Handbook," write: Rome Cable Division of Alcoa, Dept. 3-40, Rome, N. Y.

*PATENT NO. 2,904,621

Size	Nominal Current† (amperes)	Wt./ft. (lbs.)
4 x 4	2,800	5.4
4 x 6	3,500	7.1
5 x 6	4,050	8.9
5 x 8	5,000	11.7
6 x 6	5,000	14.2
8 x 8	7,000	19.0
11 x 11	10,000	31.0
12 x 12	12,000	38.0

†Based on 30°C rise above 40°C ambient still air



ROME CABLE
DIVISION OF **ALCOA**

For phone number of closest representative see advertising index in back of book.

EW news roundup

DEMAND FOR ENGINEERS UP IN '60—The 14th annual Endicott Report covering trends in the employment of college and university graduates in business and industry indicates that 19% more graduate engineers will be needed than in 1959. Engineering salaries will be up again, starting at about $515 a month, about $80 per month more than their nontechnical colleagues.

TURNABOUT—The $80 hiring premium looks good *but* the initial salary advantage is lost within 5 to 10 years after graduation.

The Endicott Report always covers the problem of turnover among newly employed graduates. A survey of reasons for leaving indicates that graduates felt they were in the wrong business, were not challenged by their job, wanted more pay or preferred to live elsewhere.

NEW TWIST IN RECRUITING—With the wooing of technical graduates down to a fine science, manpower hungry firms are learning how to go after middle management engineers.

SAMPLE TECHNIQUE — John Brown, capable young engineer, age 35, earning $9,500 a year, receives a letter from so-called "executive personnel placement firm." The letter tells him that a friend, who wishes to remain anonymous, has recommended him as an influential and progressive young man with a broad circle of acquaintances among engineers in his age bracket. They go on to say that they have job openings for people doing just about what he is doing with salaries from $14,000 to $18,000 per year.

They ask John Brown to send them (confidentially, of course) the names of any young men in his acquaintance who might not be presently happy—and they enclose an application form.

RESULTS—Well, what would you do if you were John Brown?

—EW—

U. S. ENGINEERING EDUCATION is like a duck swimming: "On the surface, everything may look serene, but underneath, educators are paddling industriously," so stated M. L. Manning of South Dakota State College. In a paper on engineering education, Manning said that rockets and research have introduced "new dimensions to engineering knowledge," and that the old distinctions between mechanical, electrical and civil engineering "have partially vanished" and the "basic principles of engineering analysis together with the science and mathematics subjects, basic to engineering, can easily occupy a full four-year program if the humanities and social studies are included."

MIT'S DR. GORDON BROWN pointed out that the old doctrine of specialized four-year curriculum "stemmed from the assumption that technology would not change appreciably during an engineer's career. But today . . . with each successive commencement exercise, it becomes increasingly difficult and . . . unwise to equip graduates with specialized know-how skills related to contemporary engineering practice."

—EW—

THE AIEE HAS ELEVATED George H. Groh, vice-president in charge of research and planning for the Arizona Public Service Co., "for contributions to the development of a rapidly expanding electric power system." At the same time they raised Prof. David F. Tuttle Jr., professor of electrical engineering at Stanford University, "for contributions to the theory and solution of electrical networks."

—EW—

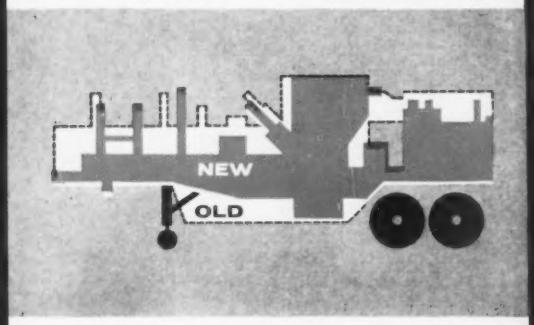
THIS FALL 240,063 students registered in engineering in the country's ECPD accredited engineering schools. This figure is a drop from last year's 249,950 and 1957's 257,777.

While there are plenty of good non-ECPD accredited engineering schools, these figures represent 154 engineering institutions and the implications are clear that engineering shortages may be more a way of life than a phase.

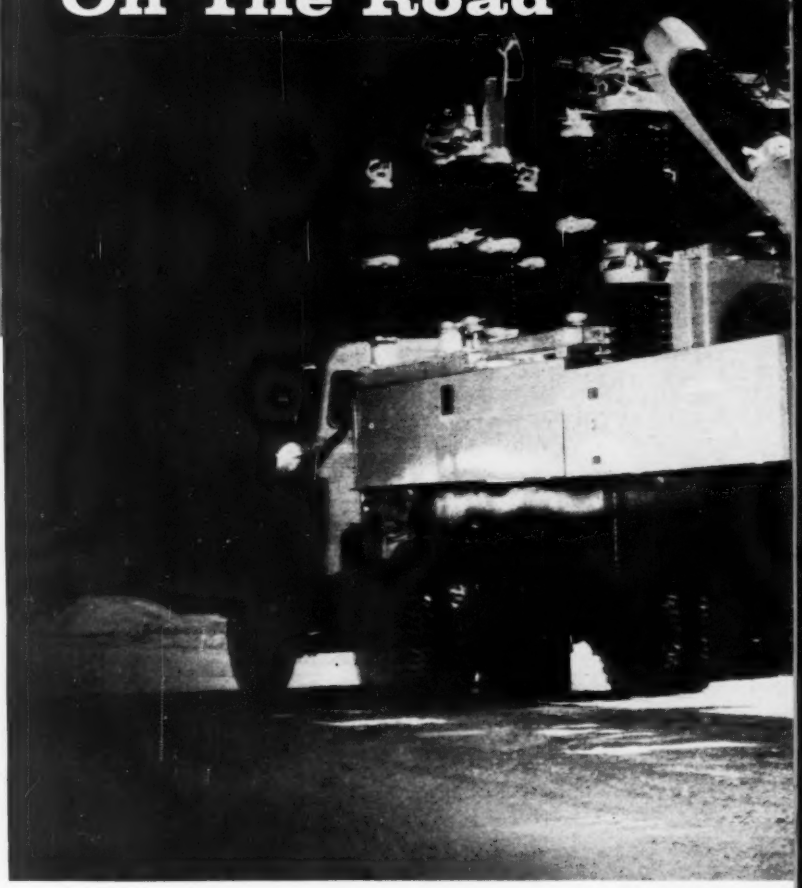
DESK TOP POWER LAB—Modern miniaturization techniques have condensed the electrical machinery lab to a table top, bringing comprehensive laboratory instruction within the budget of the smallest engineering school. This equipment may replace conventional power labs, which today cost a school upwards to $40,000 in equipment plus $100,000 in facilities. Lab kits come on a standard or custom basis, with components selected to meet specific curriculum requirements. Literature available from Lebow Associates, 14857 W. 11 Mile Road, Oak Park 37, Mich.

General Electric
Mobile Substations
and
Mobile Transformers

All New Mobile Design Gives You More Kva per pound On The Road



Higher capacity, lower weight of General Electric mobile units open new areas for savings and service to utilities.



- **Reduces Investment in Unused Capacity**
- **Cuts Operating Cost**
- **Improves Customer Service**

Dramatic improvements in General Electric mobile substation and mobile transformer designs now make possible far more kva per pound on the road than ever before. Complete mobile substations rated up to 20,000 kva, 115 kv and mobile transformers up to 40,000 kva, 138 kv are now available from General Electric. Typical of these units is the 17,000 kva, 115 kv substation shown above.

Progress in Design

A 705 computer cuts engineering time, while determining the optimum transformer design in all areas of consideration such as cooling, insulation, size and weight —whatever the kva and voltage rating requirements.

New straight-beam trailer provides a lighter, stronger unit.

Simplified low-voltage switchgear with a 5-cycle, outdoor-type circuit breaker reduces weight, speeds interrupting time.

Use of Formex* turn insulation for all windings rated 350 kv BIL and below permits safe loading beyond the normal 55 C rating, thus effectively increasing the available kva.

Progress such as this pays off for you in better mobile substation and transformer designs, faster delivery . . . and the most kva per pound on the road!

Economical System Operation

Enjoy savings in many ways from these flexible utility tools. For instance, a G-E *mobile substation* can bypass a complete pe..manent substation permitting planned maintenance during regular hours with no loss in service and with increased safety to personnel. Careful scheduling means higher-quality maintenance.

System changeovers can be made quicker, more economically, and without service interruption. New loads can be picked up immediately.

Mobile transformers can help reduce your investment in spare capacity! They can provide the necessary back-up protection for emergencies at far less cost than spare stationary transformers or underloaded transformers. All stationary units on the system can be put in service and loaded to capacity.

These are only a few of the ways your utility can profit with General Electric mobile substations and mobile transformers. Get the full story from your G-E Apparatus Sales Office; or write Section 422-44, General Electric Co., Schenectady 5, N. Y.

* Registered Trade-mark of General Electric Co.

GENERAL ELECTRIC

news

This recent photo of Priest Rapids Dam, nearing completion on the Columbia, shows from top down: the west earth embankment curving off into the distance; west bank fish facilities; 22 spillways; the power house; and start of the east bank fish facilities in lower left foreground. Being built for Grant County PUD, the dam is the Columbia's longest

Model of Tacoma's Mayfield Dam on the Cowlitz, where four turbines will generate 160,000 kw, taking the entire flow of the river. Final construction has been started by Perini Corp. under a $10 million contract. The dam (185 ft high in a canyon 40 ft wide) is relatively small in comparison with the spillway section at right, built on solid rock. Water from the reservoir behind the tunnel enters an 860-ft tunnel, 37 ft in diameter, at the upper left and drops 200 ft to the power house at lower left

Initial unit of Sacramento Municipal Utility District's $1,500,000 Station B is going up on a downtown site at 19th and N Sts. The modern building, designed by Barovetto & Thomas, has a suspended roof of fiberglas and tar; is of tilt up, pebble grained concrete panels. Plans call for construction in three stages over 10 years. First unit will be finished by fall

Probably transmission line cable was not its intended target but that is where this hunting arrow struck and remained until dislodged by Patrolman John Wenzel, riding a floating ladder. The cable is part of the Los Angeles Department of Water & Power's Valley transmission line

Power Priority For Upper Colorado

Commissioners of the Upper Basin Colorado River commission, meeting in Salt Lake, have agreed to the following priority schedule for project power developed on the Upper Colorado:

1. Preference customers in the four upper basin states.
2. Preference customers in the secondary market area, including portions of California, Nevada and Arizona. Sale to preference customers in the secondary market area would be subject to recapture when required by the four-state primary market.
3. Private utilities in the four-state primary market area.
4. Private utilities in the secondary market.

The commission voted to send delegations from each state to support these views in Congress. However a rift had apparently developed between New Mexico and Colorado. Commissioner John Bliss of New Mexico said that it was his "unpleasant duty" to inform the agency that New Mexico and Colorado had been unable to agree on two projects in those states and that New Mexico felt she was not receiving reciprocal treatment.

The Colorado River Basin Consumers Power Inc., a nonprofit corporation composed of preference power users in Colorado, Utah, New Mexico, Wyoming and Arizona, has received a report from the Kuljian Corp. of Philadelphia, a firm it retained to study the transmission and distribution systems required for the Colorado River projects in the area. Head of the Kuljian survey group is Harvey McPhail, former assistant commissioner of the Bureau of Reclamation.

The "engineering" survey, available in jig time, allowed as how the proposal by the five private utilities to the Bureau of Reclamation was "not in keeping with the spirit and intent of the Upper Colorado Authorization Act."

The report continues, "it is with a view to avoiding the possibility of incorrect conclusions being drawn by the Congress or the Department of the Interior and to protect the interest of the Colorado River Storage Project and the power customers entitled to preference under law that the Colorado River Basin Consumers Power Inc. has caused an independent report to be prepared."

Among the conclusions: no firm power will be available to private utilities from the Colorado River Storage Project.

Recommendations included: the transmission system would be wholly federally owned; would serve all important preference customer load centers; would interconnect to federal power systems of the Colorado River Storage Project with those of the lower basin area of the Colorado River and the Western division of the Missouri Basin, thus permitting full integration to the benefit of reclamation repayment obligations and customer cost of power.

New Study on BPA California Tie

Governor Pat Brown's special assistant on water affairs, Ralph M. Brody, announced to the California Municipal Utility Assn. that the State of California was retaining H. Zinder & Associates to restudy the problem of power interconnection between the Bonneville system and California. Alluding to the existing report submitted by the Bonneville Power Administration to the senate committee, Brody said, "they have made a molehill out of a mountain." Brody's rationalization for the additional study was based on the fact that the original report did not consider all of the conservation benefits —nor the value to national defense.

The Bonneville report, which gives final recommendations to the senate interior committee, reiterated the original proposition that the only feasible scheme would be a 230-kv link tie through the COPCO system to PG and E.

Observers, noting the political makeup of the committee, feel that the intertie will be left in limbo until the California study is completed, a development which may practically push action back as much as a year.

Recommend License For High Mountain Sheep

The Oregon Water Resources Board has recommended the granting of a state license for the Pacific Northwest Power Co.'s High Mountain Sheep project on the Snake River. This action came following hearings on the matter at Salem and at the dam site, and was apparent reversal in the board's policy on Snake River developments since the board has never granted a state license for Idaho Power's Snake River projects. The board declared that the project should "be developed at the earliest opportunity to meet the anticipated energy requirements of the State of Oregon." They continued, "utilization of these waters of the Snake and Imnaha Rivers for power production, flood control, recreation, navigation and fish life will represent the highest public benefit to the state."

Following the board's action, the Oregon Natural Resources Committee voted to use all of its efforts to secure Congressional passage of a pending bill which would make the Salmon River a fish sanctuary.

Will File on Nez Perce

The 13-member Washington Public Power Supply System has stated that it will file an application with the FPC for permission to develop the Nez Perce power site. Nez Perce and High Mountain Sheep are in clear competition—it being feasible to build only one of the projects. Owen Hurd, manager of the system, stated that the Army Engineers have listed Nez Perce as a highly attractive

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power site, but has not recommended for early construction because of fish problems. The public power group, Hurd states, would expect the fish passage mechanism for Nez Perce to be fully approved by federal and state agencies before construction starts on the dam.

Off-Shore Oil Line

How to transport a 1,000-ft fueling line from its assembly area on land to its resting place 1,000 ft offshore in San Diego Bay without damaging the pipe?

The solution, devised by San Diego Gas & Electric Co. engineers, was a concrete sled.

The leading end of the 10-in. steel pipeline, which already had been covered with a 2¾-in. thick coating of concrete was cast right into the sled's mold.

A heavy rubber hose was attached to the open end of the pipeline and a steel cable was run from the sled to winches aboard a barge anchored in the bay. The open end of the hose was carried across the water in a row boat as the sled was pulled to the unloading platform.

The storage facility will be opened in July along with the first unit of the South Bay power plant, it is reported.

Fuel oil will be pumped through the pipeline 3½ miles to the power plant at pressures varying from 400 to 750 psi.

Barges will deliver the oil to the unloading platform in the bay. The oil will be pumped through the marine pipeline to the storage facility 1,000 ft away. Orders for fuel oil will be in 100,000 bbl lots, brought in five barges with 20,000 bbl capacity each.

Principles Set Down

As a result of the proposal made by five Western utilities, meetings have been held with officials of the Bureau of Reclamation and, according to N. B. Bennett Jr., assistant commissioner of the USBR, a constructive step has been taken toward the understanding of principles.

These "principles" include:

1. Lines constructed by the investor-owned utilities must be of sufficient capacity to assure delivery of available power;

2. There must be no interference with the ability of USBR to serve preference customers to the extent that they would be served by federally constructed lines;

3. Backbone lines must provide suitable integration among federal power projects at the time required to meet project objectives and project use must at all times be the overriding consideration;

4. Charges made for delivery of power must not adversely affect the project feasibility and pay-off and particularly must be such as not to reduce quantity or timing of irrigation assistance; and

5. If utilities construct the backbone, high voltage transmission lines, they must accept also the responsibility of providing transmission for delivery at lower voltage to load centers of preference customers to the same extent as would prevail under a federally constructed system.

► Utah utilities are **testing an act of the 1957 Legislature** which requires the state to **pay for the relocation of utilities** as a result of highway construction. The test case grows out of an opinion issued by Attorney General E. R. Callister, now a justice of the state supreme court. Callister has disqualified himself from the case for the purpose of this hearing. The Attorney General's opinion indicates that the 1957 act violates the state constitution by "lending" the state's credit to a private undertaking. At stake are existing bills of $211,000 and potentially millions as the pace of highway construction quickens.

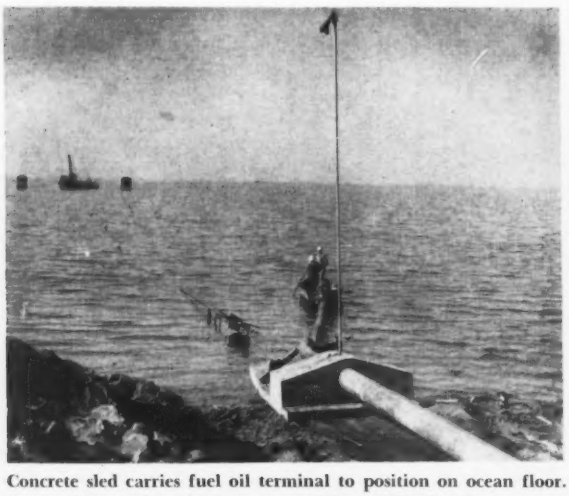
Federal Construction

Federal agencies have announced extensive transmission and distribution expansion in the Northwest and Intermountain areas.

The USBR plans to invite bids on about 600 miles of new transmission lines in North Dakota, Wyoming and Nebraska. The lines will be of the 115-kv and 230-kv class and add to the "backbone" facilities of the region. Also contemplated are two new substations and additions to seven others.

Bonneville Power Administration will build two 115-kv transmission circuits from Ice Harbor Dam to its Franklin substation east of Pasco, Wash. The circuits will be approximately nine miles long and cost about $1.5 million. The double-circuit lines will carry the full output of 310,000 kw from Ice Harbor, which is now about 50% complete.

The Corps of Engineers announces that two new hydroelectric generators of 40,000-kw-capacity each will be installed at power plant No. 2 of Fort Peck Dam in northeastern Montana. Cost of the project: $19 million, with units going on the line in the spring of 1961.



Concrete sled carries fuel oil terminal to position on ocean floor. Concrete covered steel pipe on one side and flexible hose on the other will then be weighted in place by the sled. The system allows the complete length of steel pipe to be made up ashore

Rejects Foreign Bids

Rejecting a proposal that new bids be invited from foreign manufacturers, the Tacoma Utility Board awarded a $2,549,000 contract to Allis-Chalmers Mfg. Co. for three 40,000-kw generators to be installed at Mayfield Dam.

The award was made over the protest of Board Member Murray, who charged that as much as $500,000 could be saved if the bidding were enlarged to include foreign manufacturers. Representative Murray objected again when the city's requirements for pole-type transformers were given a policy split which did not award all of the business to the two firms that were low bidders.

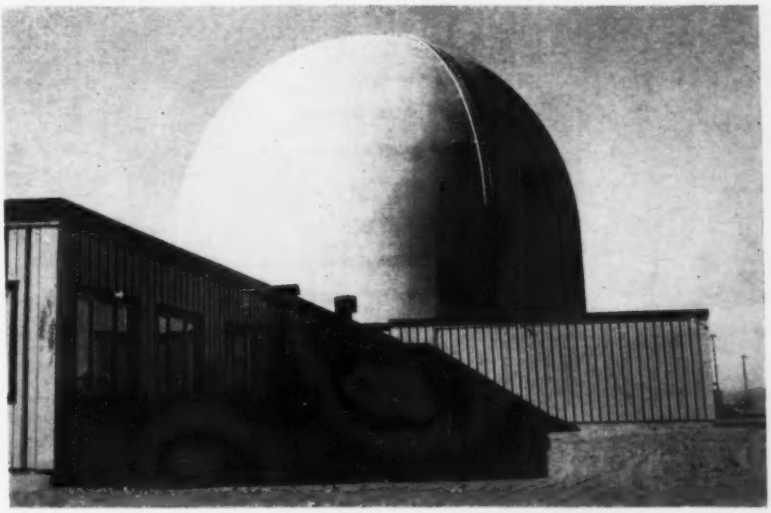
Plead Not Guilty

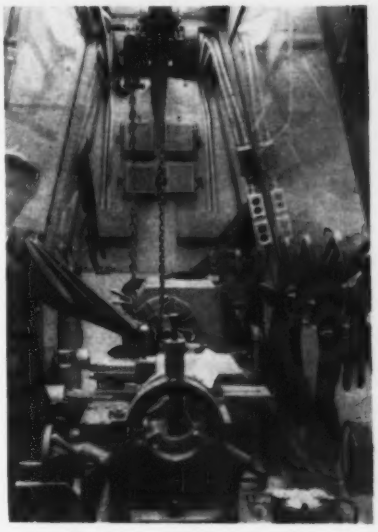
Five electric manufacturing firms, General Electric, Westinghouse, McGraw-Edison, Hubbard Co. and Southern States Equipment Co., have pleaded not guilty to charges of price fixing and other criminal antitrust violations. Eight other firms pleaded nolo contendere, a plea which in effect admits to the action but without legal prejudice. The Attorney General's office has urged the trial judge not to accept the nolo contendere plea, but have declined to say why they are adopting this position. On March 24 Judge Ganey will determine whether he will accept the nolo contendere pleas. Meanwhile he has advised the lawyers and defendents that the punishment will not be the same for an immediate plea of guilty or nolo contendere, as if they are found guilty as a result of trial.

► **Utah Power & Light's** President Ed Naughton reported that the average cost of electrical energy produced on his system has dropped 11% in the last decade. Naughton attributed the record to expansion of steam-electric generation in the service area. Looking ahead, he indicated that by 1975 UP&L would be serving 1.6 million people with a system that would peak at around 2 million kw.

► **A 4½% wage increase,** offered by the San Diego Gas & Electric Co., has been accepted by Local 465 of the International Brotherhood of Electrical Workers. This establishes a new hourly wage rate of $2.04 to $3.49 in 21 job classifications. The same increase will apply to nonunion employees and supervisors throughout the company, according to H. A. Noble, vice-president.

Nuclear News





Plutonium recycle test reactor that will go into operation this summer at Richland, Wash. Below, interior view of enclosed lathe used to machine plutonium-aluminum alloy rods for use in reactors. The program, it is hoped, will demonstrate the feasibility of reclaiming the plutonium produced as a by-product in uranium-fueled reactors and using it as a fuel in reactors similar to the one pictured above

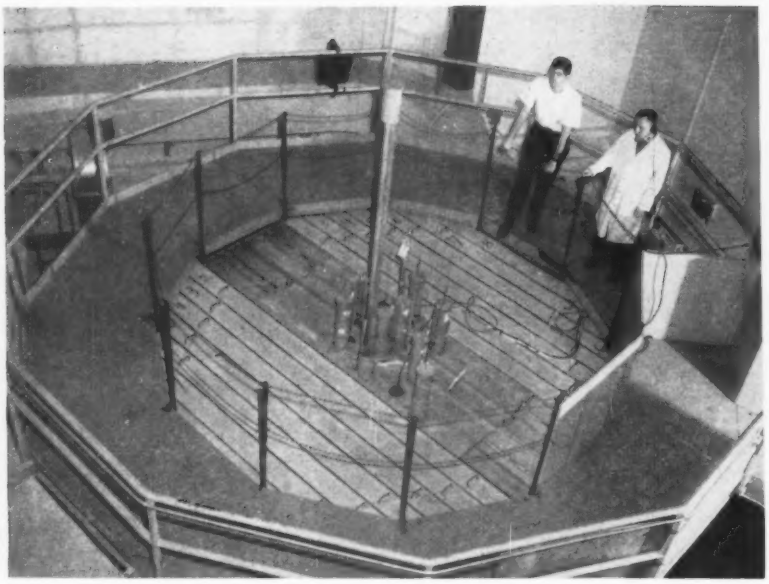
Boiling Water Reactors

Three different boiling water reactors were the object of recent AEC action.

1. The AEC has set March 29 as the date for a public hearing on the construction permit for a high density boiling water reactor plant proposed jointly by General Electric Co. and Consumers Power Co. This plant to be located at Big Rock Point, Mich., would have an initial capacity of 50 emw with the possibility of going to 75 mw at completion of research and development. The AEC is currently negotiating contracts with Consumers Power for waiver of fuel use charge during the first five years of operation and for participation in post-operation R & D. Bechtel Corp. has been selected as the architect-engineer and constructor of this plant, estimated to cost $27-$30 million.

2. The AEC has signed a contract with General Nuclear Engineering Corp. for the final design of the nuclear portion of a demonstration plant to be built in Puerto Rico. In January 1960 a contract was signed with the Puerto Rico Water Resources Authority under which the authority would provide the site and conventional generating equipment, would operate the reactor and purchase steam from the commission. This reactor, a boiling-water type, would produce nuclear superheated steam in its core. The expected electrical output is 16,300 kw. This feature of producing superheated steam will be a desirable addition to the boiling water concept.

3. The AEC has set April 5 as the date for a public hearing on the application of General Electric Co. to amend its operating license for the Vallecitos boiling water reactor. The company seeks authorization to operate this reactor with certain modifications including a new fuel arrangement, new type of control rod



Engineers of Atomics International inspect control and safety rods of a sodium-graphite reactor critical facility now operating at the company's nuclear field laboratory near Los Angeles. It will provide data for determining fuel requirements for the sodium-graphite reactor being built for the 75,000-kw Hallam nuclear power facility

and actuator and with both turbine-driven and electrically driven coolant circulation pumps. Approval, if granted, will allow resumption of operation at a maximum of 50 thermal mw.

Gas Cooled Reactor Experiment at NRTC Goes Critical

On Feb. 23, the gas cooled reactor experiment located at the National Reactor Test Station achieved criticality. This experiment is the initial phase of a program to develop a mobile nuclear power plant for the Army. This reactor, designed and built by Aerojet-General uses a water moderator and a nitrogen gas coolant. This reactor system, when combined with a gas turbine conversion system, will produce a mobile unit weighing 38 tons and producing 400 ekw.

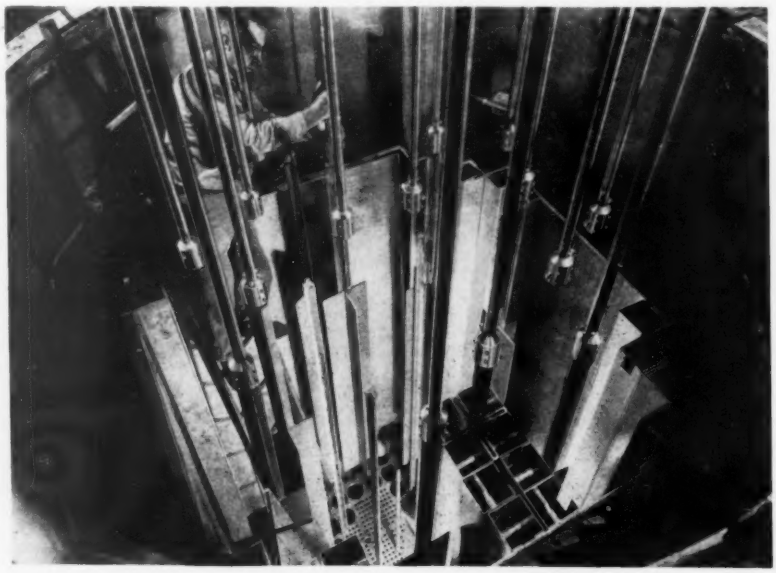
► The **Atomic Energy Commission** has signed a contract with Cleveland Pneumatic Industries Inc. for a year-long study of underwater conditions at two waste disposal sites off the California coast. The study is in line with the commission's policy of continuing reappraisal of the safety of its waste disposal measures. Earlier surveys have not disclosed any detectable amounts of radioactivity attributable to waste disposal.

► The **AEC** has addressed jointly the National Association of Manufacturers, Manufacturing Chemists' Assn. and the U. S. Chamber of Commerce, stating that it will not compete against American private business in the atomic energy field. The letter is in reply to recent charges by these groups that the government has been in unfair competition with industry. The commission further denies that it has engaged in activities and development of nuclear power that could normally be performed commercially.

Point Loma Site for Nuclear Desalinization Plant in Doubt

The AEC-Interior proposal to build a low temperature process heat reactor for desalinizing sea water at Point Loma near San Diego, Calif., has been held up. The Navy, who must transfer the site to the Interior Department, has protested the location of a nuclear reactor here from the standpoint of safety. Other sites are reportedly available for this plant. A contract to build this experimental low temperature process heat reactor has been awarded to Allis-Chalmers.

► **U. S. uranium producers** overtook the Canadian uranium industry in 1959, and are in a favorable position to capture the free world market for uranium, which is expected to take shape in the late 1960s and 1970s. In 1959 the U. S. industry shipped 15,000 tons of uranium oxide worth $280 million, twice the production of only two years ago, while Canada produced only 13,500 tons. By the late '60s, the U. S. may be adding nuclear capacity at the rate of 10 million kw annually, requiring an additional 19,000 tons of uranium oxide.



Providing valuable physics data for the design of a 203,000-kw (t) boiling water power reactor with nuclear superheater is this critical facility reactor located at Allis-Chalmers Greendale laboratories

Communications

NCUR, taking cognizance of hardships experienced by members of the Power Radio Service in the States of Washington, Oregon, Texas, Louisiana, Arkansas and Oklahoma since the 1958 "split channel" order, has filed a petition with the FCC asking for relief. In what would appear to be a misguided attempt to provide more channels for other services in the 152-mc band, the FCC had specifically refrained from allocating any of the newly derived "splits" to the Power Radio Service in these states in spite of the fact that the service had been given some of them in all of the other states. This has not only impaired operations in the states affected; but, since the radio waves are no observers of state boundaries, it has had the effect of prohibiting operations in adjacent states far outside of its intended sphere of influence. This is certainly a fine example of the need for representation at a national level such as is provided by the National Committee for Utilities Radio. NCUR action was sparked by Bill Leidigh Jr. of Portland General Electric Co.

The Jet Streams, which have propelled high flying aircraft at record ground speeds, now have a radio counterpart—military radio research has found that some areas on the earth, particularly where the Trade Winds blow, develop a stratification or duct effect at an elevation of about a mile above the earth. Tests run from airplanes flying in the ducts produced usable VHF signals from low power transmitters as far away as 1,500 miles.

General Electric Co. has announced a transistorized microwave multiplex system with the astonishing capacity of 600 voice channels. It is characterized by small size and very low power requirements, both of which will be very welcome to the communications engineer. Not too many years ago, a very pertinent question regarding any microwave system was: how many channels will it handle? The proper question now may well be: can the company expand fast enough to use the potential communication facilities?

Comments on EIA microwave bandwidth proposal will be accepted by FCC until the first of April. The date was extended in order to give several interested groups time to study the proposal. It is probable that the proposal will be influential in helping the FCC arrive at suitable technical standards.

Esaki or Tunnel Diodes, as they are variously known, have been used successfully by Bell Labs for broadband amplification into the microwave region. The experimental model uses a number of diodes distributed along a modified section of wave guide to boost the signal progressively. The diodes amplify because of a negative resistance characteristic under certain operating voltages. Very low power consumption may make them attractive for many applications.

Recent FCC Order modifies part 11.8 (a) (2) of the Rules and Regulations to read in part that "All stations operating on any adjacent frequency 15 kc or less from the requested frequency and within 35 miles of the proposed station" will require frequency coordination. FCC is losing no time in implementing a policy of producing more channels by reducing spacing and bandwidth. The techniques that may be used in the future for 5-kv channel spacing will no doubt be very interesting! however, operation won't compare with the wonderful noise silencing of 15- or 20-kv FM —or will it?

Joint Technical Advisory Committee (JTAC) has been asked by the FCC to make a study of frequency diversity. This technique has been used successfully by common carriers for reducing outage time on microwave paths; however, FCC has frowned on its use by industrial services. If JTAC accepts, it is to be expected that the report will carry considerable weight. Its recent report on scatter propagation, which was published in the January issue of the *Proceedings of the IRE,* was very complete and considered authoritative in that field.

Financial Briefs

Utah Power & Light Co. directors have declared a quarterly dividend of 33¢ per share,. The dividend totals $1,614,000. The company reports that half of the 18,000 shareholders reside in Utah, Idaho, Wyoming and Colorado, the states in which the utility operates.

Mountain Park Electric Inc. has asked the Wyoming Public Service Commission's approval to delay interest payments on part of a $770,000 loan obtained from the REA.

Dillion, Read & Co. Inc. of New York City has been hired by the **California Department of Water Resources** to make a complete review of financial aspects of the state's water resources development program. The report, it is hoped, will quash criticism of the $750 million bond issue scheduled for November's general election.

Puget Sound Power & Light Co. has filed an application with the FPC for authority to sell $20 million worth of first mortgage bonds due 1990.

Southern California Edison's Board Chairman Harold Quinton has announced that his company's net income for 1959 has amounted to $43,394,000, $3.80 a share as compared with $40,005,000, or $3.70 a share, for the previous year. Quinton noted that his company's largest single expense during the year was—taxes—an amount equal to 29¢ out of every dollar of gross revenue.

Pacific Gas and Electric Co. has received authorization to construct a new Stanislaus hydroelectric power plant on the Stanislaus River. The new plant will replace a 40,000-kw plant and will have a capacity of 81,900 kw.

Paul Shaad, general manager and chief engineer of the **Sacramento Municipal Utility District,** has announced that he will ask the board of directors to set April 28 as the sale date for another $30 million of SMUD revenue bonds to continue financing of the district's Upper American River project. The total project is estimated to cost about $109 million and be capable of producing 238,000 kw. Shaad indicated that the district will not only be able to furnish funds for the project cost in excess of the $85 million bond authorization, but net revenues will be ample to service all bonds in debt and provide funds for additions and betterments of the electric system of the entire SMUD service area.

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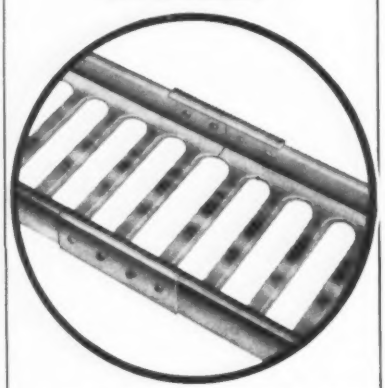

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Market Development

Equipment Workshop

Orienting its district home economists for the "nuts and bolts" side of their job, Southern California Edison Co. holds a yearly equipment workshop, where various makes of appliances are demonstrated and service pointers are given. The 1960 session was held March 8-11 at the company's Santa Monica Electric Living Center, under guidance of Evelyn Conant, home service director.

Repeated this year was the range serviceman's panel, an indoctrination for first timers and a refresher for the others. Eddie Krug, supervisor of range service, was at all the meetings, with five different servicemen attending each day. The panel is a two-way affair, with an interchange of questions between the servicemen and the home economists.

While the range came in for its full share of demonstration time, the dishwasher shared the stage. Although this appliance can't make or break the Medallion program, it is gaining acceptance; is included in promotion programs. A knowledgeable utility staff can help the homemaker and the industry.

On hand to tell about the equipment were: Lorine Craft, Westinghouse Supply; Leona Lieblich, Frigidaire; Mary Jane Isenburg, G-E; Clara Sherburne, Hotpoint; Sylvia White, Waste King Corp. Edison home economists pinchhitting for other manufacturers were: Elizabeth Novak, KitchenAid; Molly Cooksey, Thermador; Barbara Swain, Tappan; Marianne Terry and Erma Wingate, Kenmore.

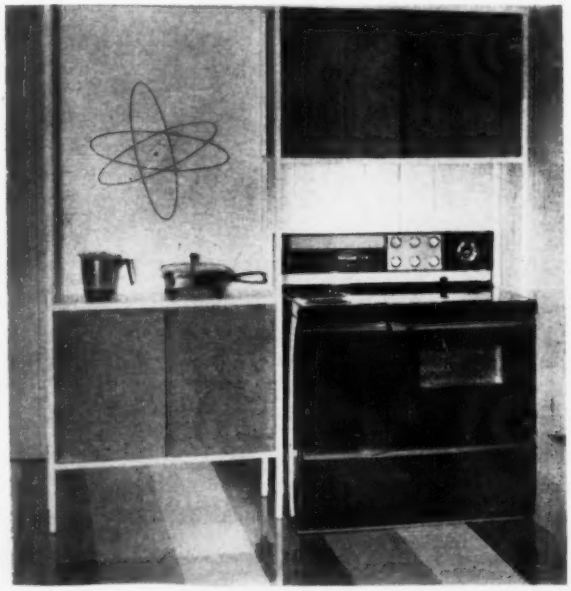
Mrs. Conant briefed the company's home economics program for 1960. With 17 electric living centers, Edison home economists last year had a total audience of some 75,000.

In Terms They Understand

A Los Angeles Department of Water & Power ad recently pointed out that for 10¢—the price of an ice cream cone—enough electricity could be purchased to wash and dry a load of clothes, cook a meal on an electric range, run a vacuum cleaner for an hour, light a 50-w bulb for two hours, play television for an hour and make toast for breakfast.

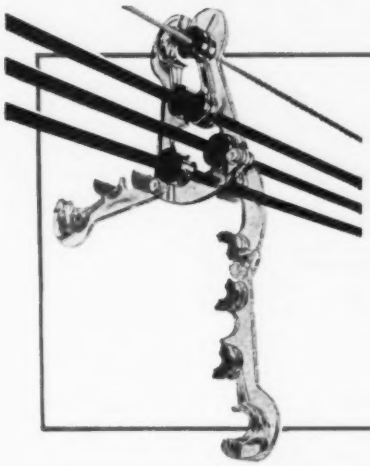
► The **Los Angeles Chamber of Commerce** reports that capital expenditures for new and expanded electric equipment and appliance facilities will total $9 million for the year 1960.

► In the annual stockholders' report, J. H. Clawson, president of **Puget Sound Power & Light**, reported that Puget Sound's residential customers increased their consumption of electricity by 770 kwh. This is 10% more than the previous year and four times greater than the average increase for the nation as a whole.



First application of a combination electronic and standard oven in a free-standing range is being shown by Westinghouse. The large oven of the two-oven range is equipped with a magnetron for microwave cooking as well as the standard bake and broil electric elements. The range also has two surface units

Compresto® NOW AVAILABLE AS SPACED AERIAL CABLES



THE ULTIMATE IN A *COMPACT* SYSTEM CAN NOW BE ACHIEVED BY COMBINING Compresto CABLES WITH **PLM's** NEW "WRAPAROUND" **5KV** SPACERS

FOR **15KV** SPACED AERIAL CABLE SYSTEMS USE **Southern Electrical's** Compresto CABLES AND **PLM's** NEW HIGH **ALUMINA** "WRAPAROUND" "LIFETIME" SPACERS

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"Superforms help me accomplish my Number One Job Function:

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Transmission Engineers not only must know the requirements for their lines . . . they must also see that they are met. And, they have found that Fanner Superformed products are always reliable.

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FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

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Growth for Northwest

Undiminished growth in use of electric energy by householders of the Pacific Northwest for the next 10 years is forecast in the 1959-69 advance program of the Bonneville Power Administration.

The forecast predicts that average domestic consumption in the area will rise from the 8,500 kwh of 1958 to 14,000 kwh in 1969.

"The region's low power rates will encourage the use of appliances which still have a low market saturation such as clothes dryers and air conditioners," the report says. "Electric heat, which requires annually from 12,000 to 18,000 kwh per home depending on the climate, is becoming increasingly popular and in some localities is being installed in a majority of new homes.

"Evidence of the rising standard of living is seen in the use of more and bigger appliances requiring a greater energy consumption. The market for 'seconds' has extended from radios and television sets to week-end homes."

The report forecasts that the region's domestic load will double from its 1958 figure of 11½ billion kwh to 23 billion kwh in 1969.

► **Four new buildings** in Seattle's central business district are providing a substantial new load for Seattle City Light. The Washington, Norton and Logan office buildings and a new public library will provide a total estimated demand of about 7,500 kva, or approximately one-eighth of the present power demand in the downtown area. Air conditioning and high lighting levels contribute to the high use.

► **Portland General Electric Co.'s exhibit building** at the Oregon Centennial Exposition will be moved to the Oregon coast resort community of Yachats, where it will house a bar and a florist shop. The model of a thin arch dam, similar to PGE's Pelton and North Fork projects, which was a feature of the PGE Centennial exhibit, has been moved to the North Fork project power house as a display for visitors.

► April 27-30, 1960, are the dates for the **Western Air Conditioning, Heating, Ventilating and Refrigeration show** at Los Angeles. Fred J. Tabery, 3443 S. Hill St., is exhibit manager for the exhibit and conference to be sponsored by Western Air Conditioning Industries Assn. at Shrine Exposition Hall.

Heating Promotion

Promotion of electric heating will be a year-long activity by the Southern Colorado Chapter of the National Electrical Contractors Assn. The exact methods of promotion are to be developed in meetings of the chapter's executive board, according to Simon Halle, executive secretary.

Kenneth A. Weaver, Ken's Electric Co., Colorado Springs, was elected chapter president to succeed Earl Coleman of Coleman's Electric Co., Pueblo. Other officers are Pete Montera, Steel City Electric Co., Pueblo, vice-president for the Pueblo Division; L. D. Mayfield, Belco Inc., Colorado Springs, secretary-treasurer; directors — Harold Whitney, Whitney Electric Co., Colorado Springs, and Earl Coleman, Coleman Electric Co., Pueblo. James D. Berwick of Berwick Electric Co., Colorado Springs, was re-appointed governor.

► A new product name, **Waste King** Universal, has been announced by Waste King Corp. of Los Angeles and its subsidiary, Cribben & Sexton. A. L. Haggard, vice-president, marketing, is heading up a joint marketing program. General managers in charge of marketing operations in the West are: **Stanley Rudnick, Denver,** Southwestern; **Milt Shaw, Los Angeles,** Pacific; **Ed Craven, San Francisco;** Western.

This "red hands" poster carried on Seattle City Light trucks won third-place award at the 28th annual national competition of outdoor advertising art of the Art Directors Club of Chicago. The hands are in red, the background in black. The design will be part of a traveling exhibition before leading advertising groups in principal U.S. cities

Sales Appointments

► **Charles E. Filbin** has been appointed residential sales director for Pacific Power & Light Co. to succeed **Lea Phillips,** recently advanced to administrative assistant to Paul B. McKee, chairman of the board. Filbin has been Kalispell, Mont., district sales manager since 1957 and previously held a similar post at The Dalles, Ore. He joined PP&L in 1947.

Filbin

► **H. C. Bulis Jr.** has been appointed manager of dealer sales for the Denver district of the General Electric major appliance sales and distribution department. He has been stationed at Dallas as manager of G-E's dealer sales for north Texas. Bulis succeeds **F. W. Curle,** appointed manager of dealer sales for the southern California district.

► **Larry R. Swiney** has been appointed district sales manager of television, radio and stereo hi-fi in the Intermountain and Southwest territories for Packard Bell Electronics, with headquarters in Denver, Colo. **Richard D. Sharp,** director of marketing, Home Products Division, said that Swiney's newly created post resulted from increased sales. In his new post, he will report directly to Sales Manager Robert H. Thompson.

Swiney

► **Elliot C. Noska** has been appointed to the newly created post of commercial sales manager for the Home Products Division, Packard-Bell Electronics Corp., **Richard D. Sharp,** director of marketing, announced. Noska will be in charge of factory direct sales of TV, radio and stereo hi-fi equipment to hotels, motels and hospitals.

► **William Thomas Jr.,** appointed manager of the utility department for Norge West Central Division, will be responsible for sales to utilities in Colorado. His headquarters are in Greeley.

There's a Royal "POWR-KORD" for every need:

- RUBBER or VINYL
- BLACK or RED (rubber)
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- HANDY LENGTHS — from 10' to 100'
- IN THESE TYPES and SIZES:
  #18 and #16 SJ — 2- and 3-conductor
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Here's the kind of rugged construction that pays off on the job: MOLDED-ON caps and connectors, — built-in strain reliefs — Royal-quality cord — heavy brass blades and double-wipe contacts — locked-in-place molded construction . . . and FULLY UL LISTED!

Next time you're ordering electrical supplies from your wholesaler, be sure to include Royal "POWR-KORDS".

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SALES REPRESENTATIVES AND WAREHOUSES: Los Angeles—1950 Naomi Avenue, RI 7-9655; San Francisco—1225 Sixth St., HE 1-5792; Seattle—4130 First Ave., So., MA 3-8882; Denver—888 S. Lipan Street, WE 6-3456

Taking over as president of SRVEA, Al Gilbert accepts gavel from Joe Wright. Smiling Baileys of Idaho Power look on during banquet climax

SRVEA Conference Foresees Change in Economy

Idaho's unique place as a resource state—with abundant land, water, and power—was brought vividly into focus to terminate the fifth annual conference of the Snake River Valley Electrical Assn., closing National Electrical Week, Feb. 13, in Boise. The intensely packed program, heard eagerly by record registration of 209, saw the initiation of a tighter coordination of the sales and promotional activities of the industry for the new year.

With Past President H. Ferd Koch, Electric Service Co., presiding, the business base of the industry and the need for business objectives and policies was a logical starting point for the meeting. Robert Harper, vice-president, Sylvania Electric Products Inc., San Francisco, called attention to the changes taking place in industry from technology and methods making business planning difficult. However, their need to give morale to the organization and to set up what was expected of people as well as the importance of timing showed the necessity for a program even by small business firms. He said that 50% of business 10 years from now may well be in products that do not exist today. Success with an organization plan, he concluded, depended on how well management communicated its plan and program as well as its idea to the employees and the public.

A dynamic and business-minded minister, Rev. Newell Morgan of the First Christian Church in Boise, followed with an inspiring challenge to businessmen to accept the moral responsibilities of private enterprise without which it may never succeed.

Joe I. Wright, Afton-Lemp Electric Supply Co. president, followed with a report of the year's activity by the Snake River Valley Electrical Assn. Wright said that he felt the industry was at the starting line of a race that could make the industry the economic winner. Speaking as a retiring president, proud of what had been achieved, but still with a sense of frustration of what might have been accomplished, he pleaded for far greater individual participation by the members in support of the new president.

With 225 active paid members a the start of the year and a new man ager, Elmer Ross, the potential growth, he said, was tremendous. He urged that they take the bit in their teeth and not wait for directions from headquarters. Each chapter should take on its own organization, meetings, programs and social affairs.

Elmer Ross

The new president, Al Gilbert, echoed Wright's remarks and promised utility support and coordination to a greater degree in the advertising program, area-wide campaigns, sales training classes and shows to spark the '60s.

As customary, an outstanding speaker was brought in for the noon luncheon, which the Chamber of Commerce of Boise was invited to attend. The speaker was Cecil J. Prashaw, recently retired from Frigidaire, who gave a dynamic sales talk. While it was particularly aimed at the electrical industry to stimulate it to make the most of its opportunities, its message was applicable to all sales activities in the area. To indicate some of the horizons in the future he mentioned scientific developments in irradiation of food, autonomous water supply for homes, complete air conditioning, thermoelectric generation, ultrasonic washing, electroluminescent lighting, etc., but "before we look too far down the road for the future we had better see to it that we sell everyone the products that we have."

New movies and sound slide presentations on Medallion Homes and living better electrically were given by F. M. Falge, General Electric Co., San Francisco, at the afternoon session under the chairmanship of Lysle Keith, the Lighthouse. Falge brought the group up to date on the progress of the Live Better Electrically and Medallion Home programs and complimented Idaho for being the first place in which a Gold Medallion Home was built. He particularly mentioned the new emphasis that is being given to electric house heating, both of the resistance type and through the use of heat pumps.

The afternoon session concluded with a penetrating and farsighted appraisal of the markets in southern Idaho by Robert V. Hansberger, president of the Boise-Cascade Corp. Prefacing with a review of general conditions in the United States and of world competitive conditions, he

Montage of speakers at SRVEA — Robert Hansberger of Boise-Cascade; Cecil Prashaw of Frigidaire; Francis Falge, General Electric Medallion Home director

Meetings

QUALITY-SERVICE

CADWELD electrical connections rank first in both categories.

QUALITY—The connection has 100% current carrying capacity —cannot loosen or corrode and will outlast the life of the conductors.

SERVICE—Stocking CADWELD distributors are located in all major trading areas in the United States and all are continually serviced by our staff of company field engineers.

For the best in electrical connections—specify Cadweld

CADWELD

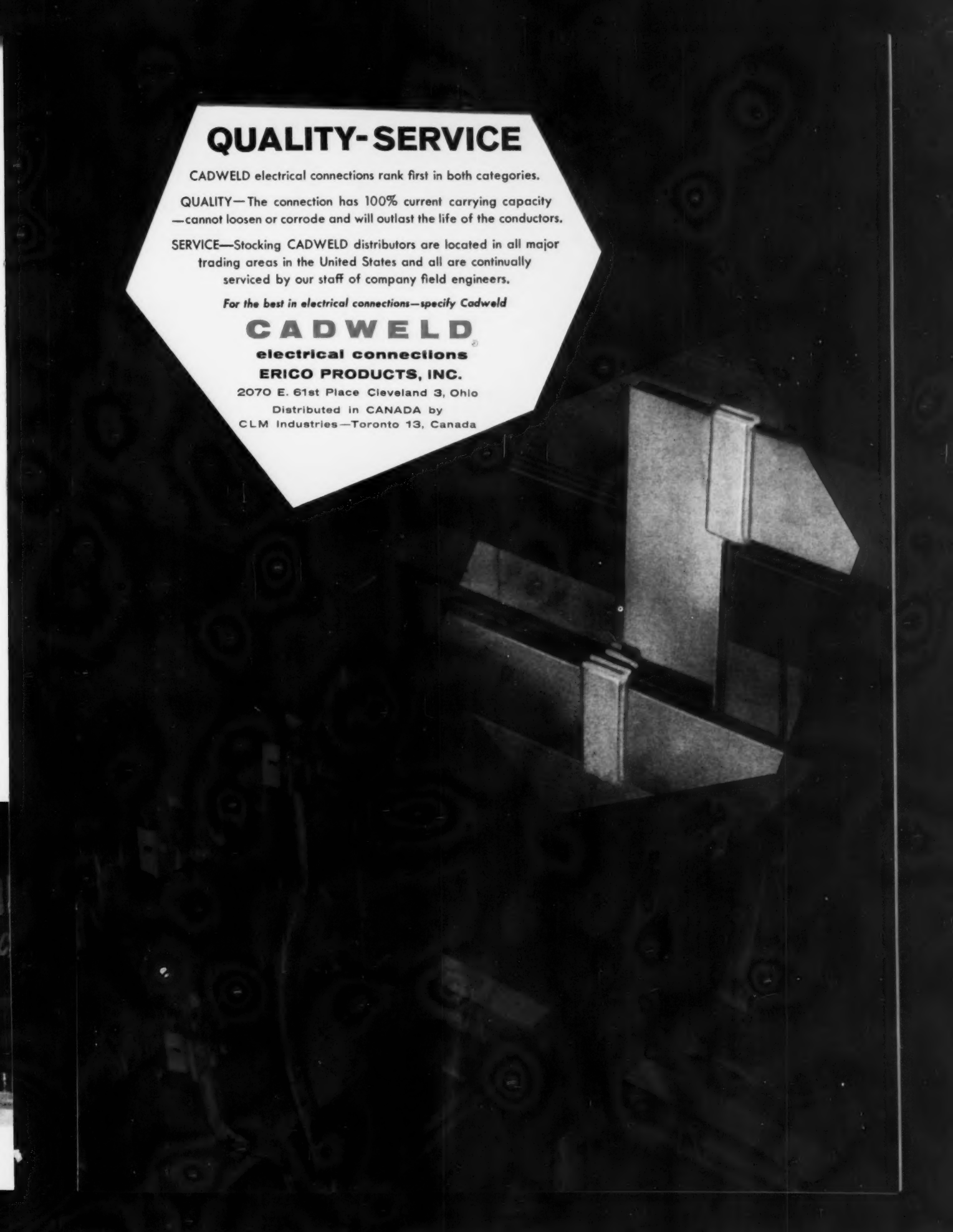
electrical connections

ERICO PRODUCTS, INC.

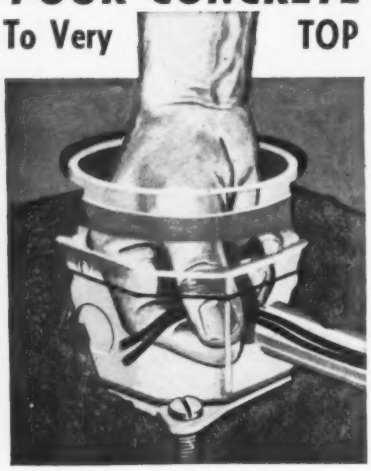
2070 E. 61st Place Cleveland 3, Ohio

Distributed in CANADA by

CLM Industries—Toronto 13, Canada



POUR CONCRETE To Very TOP



Still Have PLENTY ROOM To WORK

The #190 "Tru-Level" steel-bodied, brass-topped adjustable floor box permits pouring of concrete to very top in one operation—Or, to box-body height only, for which a second tin lid is provided.

After concrete is hardened, a full ½" horizontal adjustment is possible.

The box-body has a 3¼" opening—plenty large enough to get hand into for conduit attachment or wire-pulling.

A skin tight plastic collar seals out moisture while protecting adjusting-ring threads. No voids or water pocket can occur with plastic ring fitting tight against surrounding concrete and remaining there.

Listed under re-examination services of Underwriters Laboratories, Inc.

Latrobe Products • Non-Adjustable Floor Boxes Adjustable Floor Boxes • Gang Boxes—Cover Plates Junction Boxes—Nozzles • Pipe or Conduit Hangers Insulator Supports • Cable Supports—Fish Wire Staple and Cable Clips

Visit our Booth #516—52nd N A E D Convention Dallas—May 1-4th

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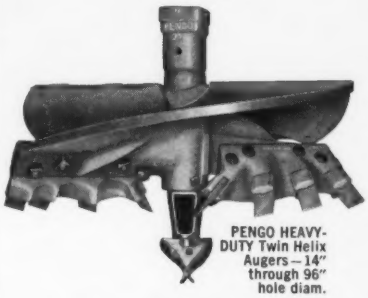
1209-1215 JEFFERSON ST.
LATROBE, PENNSYLVANIA

Sylvania's San Francisco Vice-president Robert Harper talks organization

brought the situation down into close focus by talking of Idaho's prospects. That state, he said, had a unique opportunity because it is extremely thinly settled, yet is large in area with abundant natural resources of land, water and power to produce the fruit and fruit products which no longer will be produced in California because the land is so rapidly being taken over for housing and business developments. Not only does this create opportunities for greater agricultural development, he said, but in order to reduce shipping costs most of the processing should be done in the state to eliminate the shipping of waste products. He cited examples in the lumber industry and in the potato industry. The by-products in these cases are also utilized and a market for them is created.

At the conclusion of the meeting new officers for the association were announced as follows: president, Al Gilbert, Idaho Power Co.; vice-president, Paul H. Rostock, Rostock & Clayton, Frigidaire dealer; secretary, James Bruce, Idaho Power; treasurer, Mrs. Carl Young. Chapter chairmen for the Magic Valley-Twin Falls area Mel Jensen of Cain's Inc., for the eastern or Pocatello area Don Gavin, Electrical Contractors Supply, for the Boise area Ray Spencer, Afton-Lemp Co. Representing the various groups on the board of directors are: for utilities, Fritz Cochran and Al Gilbert, Idaho Power; distributors, William Taylor, Strevell-Patterson, and Henry Falkner, Westinghouse Electric Supply; contractors, Ward Hall, Pocatello Electric, and Lysle Keith, Enterprise Electric; retailers, John Jackson, Mountain Electric, and Ferd Koch, Electric Service Co.; electronics, W. L. Reiher, Factory Radio TV Center, and Rodney Frost, Boise TV & Radio Service; manufacturers, Joe Devine, Westinghouse, and Jim McDonald, Line Material Industries; appliance repair, R. C. Adamson, Cain's Inc., and Gervase Arnold, Arnold Electric Repair Service.

PENGO AUGERS
Save you money 4 ways



PENGO HEAVY-DUTY Twin Helix Augers—14" through 96" hole diam.

1 **BORE FASTER**...put real "teeth" in earth drilling, save wear and tear on your diggers.

2 **STAY ON THE JOB LONGER** ...all wearing parts replaceable in the field; no down-time for shop welding.

3 **COST FAR LESS TO MAINTAIN** ...reversible teeth cost only 90¢ each, pilot bit only $8.00. Parts interchangeable on all PENGO augers you are using...less inventory!

4 **A SIZE AND TYPE FOR EVERY DRILLING JOB**

PENGO BORING HEADS for welding to your present auger flights.

PENGO FLIGHT AUGERS and ANCHOR AUGERS—6" through 36" diam.

IF IT'S AUGERS YOU WANT, WE HAVE 'EM—JUST ASK US!

PENGO Augers and Boring Heads are available for all popular types of diggers, from light-duty post hole and farm tractor machines to the largest heavy-duty earth drills. Write today for free catalog; please address Dept. 34

13-B

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

► The **Cal/Ore Electrical League** is celebrating its first year of operation and a successful year it has been. After two preliminary meetings Dick Finch of Home Appliance, Medford, was appointed pro tem president and continued throughout the year. Clarence L. Weaver of California Oregon Power Co. and formerly a retail store dealer himself was made the secretary-treasurer. At the first meeting in 1960 Vern Owens, Cascade Home Furnishings, Klamath Falls, was named the new president; George West, Umpqua Valley Appliance of Roseburg, vice-president; Weaver was re-elected secretary-treasurer; and section chairmen are Al Klassen, Rogue River Hardware, Grants Pass, major appliances, and Harold Wall, Sloan Co., Medford, apparatus and supply.

► A. L. Stuart of Bozeman, Mont., was elected governor of the **Montana Chapter, NECA,** at the annual meeting Feb. 20 in Butte. C. O. Schmidt, Yellowstone Electric Co., Billings, is president; Charles Powell, Hollingsworth Electric Co., Kalispell, vice-president; Earl D. Coyne, Butte, secretary-manager; and R. W. Sundberg, Sundberg Electric Co., Butte, treasurer. Stuart was president last year and succeeds Galen M. Nayler of Great Falls as governor.

► L. E. Ludekens, Southern California Edison Co., chairman of the **Operational Fixed Microwave Council,** attended the annual meeting March 18 in Washington, D. C.

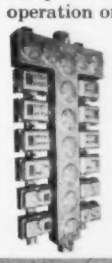
► **California Conference on Apprenticeship** will be held at the Jack Tar Hotel, San Francisco, May 18-20. It will bring together apprenticeship leaders from the entire state and in all crafts. The opening day will be devoted to general sessions and the following to workshops covering a variety of subjects. Among the officers of the conference are W. H. Diederichsen of IBEW, Local 617, San Mateo, finance committee.

► **Central California Chapter, International Association of Electrical Inspectors,** named J. W. McCutchan, Building Department, Tulare County, as its chairman, Jack Slaughter, PG and E, Fresno, vice-chairman, and Clyde Smith, secretary-treasurer, at its Feb. 13 annual meeting in Fresno. The group adopted the separate workshop technique and had industrial, commercial and residential workshops to discuss code problems. The new Fresno city electric ordinance was adopted by that city, it was announced, effective March 5.

Killark switch rack components

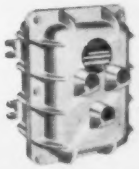
DESIGNED BY FIELD TESTS . . . PLANT SURVEYS . . . CONSULTATION WITH EXPERTS Here is the complete line of all-aluminum enclosures, completely wired and ready to install . . . designed only after extensive research in the field and consultation with dozens of industries, engineers and consultants, to learn what *you* need and want in this line.

These features are the result: *All-aluminum* for non-magnetic, non-corrosive, lightweight design that offers faster heat dissipation. *Ribbed* for greater strength. *Rectangular design* for easier installation and maintenance, more compact assembly. *Ground surfaces* for tighter fit, no threads to strip. Front operation on all components.



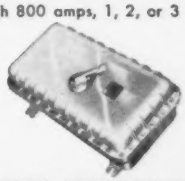
PANEL BOARDS
To your specs, including breaker of your choice. Screw-cover or bolt-on cover, rectangular or "T" wiring trough. Available for hazardous as well as all-weather areas. All seals and connections included.

MOTOR STARTERS



Manual or magnetic, in many forms. Single speed, reversing, two speed, special, and combinations.

CIRCUIT BREAKERS
Through 800 amps, 1, 2, or 3 pole.



DISCONNECT SWITCHES

Fuseable and non-fuseable, up to 200 amps.

CONTROL COMPONENTS—Push button stations, pilot lights, selector switches, contactors, relays, control transformers, lighting transformers, specials.

ILLUSTRATED CATALOG SUPPLEMENT—State your interest.

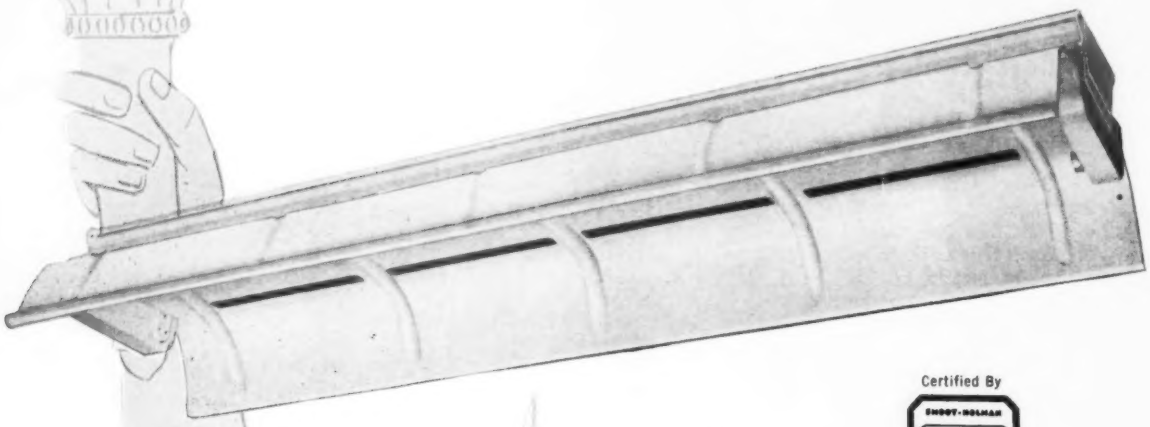
Killark
ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Aves. St. Louis 13, Mo.
Sold Through Leading Distributors
WAREHOUSE STOCKS in NINETEEN CITIES in U. S. and CANADA!

For phone number of closest representative see advertising index in back of book.

rugged, radiant, dominant!

NEW SMOOT-HOLMAN

MARK V INDUSTRO-LUX



Certified By

SMOOT-HOLMAN RLM

Far Exceeds Requirements

1960 design backed by 40 years of industrial lighting fixture experience.

*Best looking industrial fluorescent fixture available today!

*Five die-formed ribs provide maximum rigidity, straight rows!

*New reflector aligner clips prevent light leaks between fixtures in continuous runs!

*Proper light distribution. Computer designed!

Why settle for less when the best costs no more?

Write for Complete Specifications and Performance Data.

TOMORROW'S LIGHTING TODAY!

SMOOT-HOLMAN COMPANY • INGLEWOOD, CALIFORNIA

For phone number of closest representative see advertising index in back of book.

MC Tony Combs with John W. Craig, Westinghouse vice-president, and Ralph J. Phillips, vice-president, San Diego G & E

Ben Jacobson, Cabrillo TV & Appliance, bureau president, with Jessie Cartwright, home service director, Norge Sales Corp.

There's Challenge in the Competitive '60s, Bureau Told

That growth for the appliance business will not be automatic even in the soaring '60s was forcibly brought home to some 500 dealers, distributors and utility people attending the recent spring conference of the San Diego Bureau of Home Appliances.

Charging that in the 10-year civil war just past, preoccupation with price has deteriorated profits, weakened research and slowed product development to a trickle, John W. Craig, Westinghouse vice-president and manager of appliance divisions, declared that too many consumers believe that what the industry has to sell is exactly what they now have.

Sales in the late '50s of the frost-free refrigerator (a big ticket item in a high saturation category that sold almost as fast as the industry could make it) showed us some things about the customer, he said. She thinks less about price than we do; she prizes convenience and features above price; wants new things if we can help her justify her need.

After 10 years of saturating the market with far too much low-end merchandise, there is a huge prospect list for step-up selling and the replacement market can be tapped profitably, he said. But if we are to regain and increase our share of the consumer dollar, he believes we must enlarge our niche in the economy by pushing new products.

Craig sees hopeful signs. Manufacturers are spending more on all kinds of research. He would put the emphasis on consumer, dealer and market research, all of which give the direction for laboratory research.

There is no confusion in the new washers: it is in the customer's mind because you haven't told her enough about them, Jessie Cartwright, Norge national home service director, pointed out in a talk that was charged with wit and common sense.

Know your appliance, she urged. There is an age old resistance to change, she declared, but women must be educated to the new, better and easier way. Because they require top of the line equipment, wash and wear fabrics have given dealers the opportunity to sell up.

F. M. Raymond, San Diego Gas & Electric Co. advertising manager, used balloons to dramatize his story of unit sales and their dependence on advertising dollars. Following horseback estimates on 1960 sales, the colorful balloons took colored TV up from 775 to 1,000 units; electric dryers from 2,855 to 3,500; dishwashers from 3,790 to 4,500; air conditioners from 5,100 to 6,500; bed covering from 10,250 to 14,000; refer-freezer combinations from 3,100 to 3,500. Probable losers are freezers, refrigerators and automatic washers. At least that is the way sales will probably go if advertising is fastened in sales effort; if not the balloons will burst. To do its part San Diego Gas & Electric Co. and the Bureau raised the advertising budget from $287,700 in 1959 to $306,850 in 1960.

Frosty Raymond, San Diego Gas & Electric advertising manager; Wilma Furstenfeld, bureau vice president and program chairman; Clark Chamberlain, bureau manager

Crapo

GALVANIZED STEEL STRAND HAS ALL 5

1. Strength
2. Workability
3. Ruggedness
4. Long Life
5. Economy

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA STEEL & WIRE COMPANY, INC.
Muncie, Indiana

Honored

William J. Varley was honored when the annual dinner dance of the San Mateo County Chapter, NECA, was made "Bill Varley Night." He was highly commended for his years of service to the association and the industry by Everett Marshall, president of the chapter, and by a series of friends in a "This Is Your Life" type of program. Robert Walters, president of Local 617, IBEW, presented Varley with a watch and life membership in the local. The chapter presented him with an engraved plaque

Leaders of the fast growing Santa Clara-San Benito Chapter, National Electrical Contractors Assn., at recent meeting: Joe Santora, secretary-treasurer; Irving Butcher, governor; Kelvin Young, president, and Michael Giboney, vice-president

► Annual meetings of inspector groups will be held in April. **Electrical Inspectors' Assn. of B. C.** will hold its meeting at Astor Hotel, Burnaby, B. C., April 7-9. **Utah Chapter, IAEI,** will move its annual meeting to a Wednesday, April 20, in Salt Lake City, and the **Idaho Chapter,** to Friday, April 22, at Twin Falls, in order to accommodate participation by Frank Stetka, NFPA, Chicago, and W. L. Gaffney, Northwest Section secretary, who will go on to meetings in Washington.

► **Puget Sound Chapter, NECA,** has sent out a notice that plans are under way for the 1960 tri-district meeting, which will be held May 9-11 at Olympic Hotel, Seattle. The theme "Electrical Contractor Development" will predominate as the NECA's program on that subject will be launched to the districts.

Here are the Graybar Offices in the West

ARIZONA

Phoenix:	1700 North 22nd Ave. ALpine 2-2371
Tucson:	212 South Park Ave. MAin 2-6439

CALIFORNIA

Bakersfield:	2828 "K" St. FAirview 4-4755
Fresno:	2626 Hamilton Ave. ADams 7-4175
Long Beach:	800 West 16th St. HEmlock 2-2911
Los Angeles:	210 Anderson St. ANgelus 3-7282
Oakland:	1911 Union St. GLencourt 1-5451
Oceanside:	805 N. Tremont St. SAratoga 2-2141
Sacramento:	1900 - 14th St. HIckory 4-8830
San Bernardino:	655 South "H" St. TUrner 9-1051
San Diego:	720 State St. BElmont 3-1361
San Jose:	1376 N. Tenth St. CYpress 2-9090
San Francisco:	1750 Alameda St. MArket 1-5131
Santa Ana:	301 French St. KImberly 3-8309
Santa Barbara:	329 S. Salinas St. WOodland 5-1013
Van Nuys:	15520 Cabrito Road STate 2-9600

COLORADO

Colorado Springs:	630 West Vermijo Ave. MElrose 4-3701
Denver:	104 Wazee Market TAbor 5-7111

IDAHO

Boise:	1325 Idaho St. BOise 3-2594

MONTANA

Butte:	604 E. Aluminum St. BUtte 3233

OREGON

Eugene:	2380 West Broadway Diamond 4-2224
Portland:	N.E. 60th and Banfield ATlantic 8-5661

UTAH

Salt Lake City:	336 North Third West St. ELgin 9-8771

WASHINGTON

Seattle:	King & Occidental Sts. MUtual 2-0123
Spokane:	West 1033 Gardner Ave. FAirfax 7-6611
Tacoma:	2112 "A" St. MArket 7-0164

FOR IMMEDIATE SERVICE ON EVERYTHING ELECTRICAL CALL THE OFFICE NEAREST YOU

"Count on us for sure . . . from start to finish."

By "us" your Graybar salesman means the team of Graybar experts that serves you, the electrical contractor . . . whether your business be large or small.

This service team knows how to size up a job and evaluate equipment to match the need. They can unravel knotty installation problems.

Often they can make valuable suggestions on tools, for Graybar carries the most complete line of tools available from any electrical distributor.

From start to finish you can count on the Graybar service team . . . Field Salesman, Inside Salesman, Counterman, Specialist. Others too, at Graybar can help *speed your work, reduce your costs, build your business.*

Know them? They're ready to work with you—*today!*

919

Graybar Service includes: Objective recommendations • On-the-job technical help • Most complete lines • Planned stocks to meet your needs • Expert counter service • Speedy handling of will-calls.

GraybaR

ELECTRIC COMPANY, INC.

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES

Everything Electrical GraybaR

Alston Rodgers, speaker, Doral Eardley, Graybar, accepts trophy from Carlos Stone, IEA president, for outstanding service. Michelsens at their right

IEA Tries Workshops at Electrical Industry Conference

Impact of the missile program in the Utah and Idaho area shared with electric heat as new centers of interest brought before the annual electrical industry conference of the Intermountain Electrical Assn. at Hotel Utah, Salt Lake City, on Thomas Edison's birthday, Feb. 11. Another new feature: for the first time the afternoon session was divided into three workshops to afford the wide cross section of membership opportunity to discuss their chief interests. The full-day session was topped at the banquet appropriately by Alston Rodgers' spectacular parade of lamps and light sources.

Suddenly called to Washington for a hearing on upper Colorado River power distribution, E. M. Naughton, president, Utah Power & Light Co., sent Joseph Cushman, vice-president, who made a warm and friendly presentation of the company's program. Wanting to feel a strong alliance to the other members of the industry on whom the company is totally dependent for selling the usage which makes for progress, Cushman told that the company expects to install a million kilowatts in steam capacity, half at Kemmerer at the coal field and half at a new plant in the Salt Lake industrial area. Major private utilities in the mountain region will soon add more than 20 million kw, all of it interconnected to transfer the peaks of demand between the companies. First such interconnection is with Public Service of Arizona, which can distribute Glen Canyon power to the municipal purchased customers without necessity of a government duplicating line.

"We who have lived this thing all our lives naturally hate to see an industry we have raised from nothing to its present status turned over to people who deal with ideologies rather than facts. It should be kept in the hands of people who have some reputation in this field," he said.

Utah's future in the missile age was predicted in a breezy, yet informative, talk by John B. Nash, heading the Patents & Publications Department of Thiokol Chemical Corp. How the numerous new plants recently established in the area to furnish parts of the missiles and rockets for the nation's defense program create new jobs, bring new population and create tremendous markets was told graphically.

Darcie H. White, manager of business development, UP&L, brought the challenge of all this to the league members by comparing American households' expenditures for gasoline, alcohol, movies, cosmetics vs electricity and outlining the national programs of EEI, NEMA, NECA, etc.

Suggestions for improving IEA were: (1) support and interest in the new service chapter; (2) selection of committeemen with talent and the acceptance of responsibility to make a real effort to perform; and (3) a challenge to those who criticize the IEA to come up with a program.

Carlos Stone, once manager of IEA and its president, introduced the newly elected officers at the luncheon meeting. These included: Walter J. Michelsen, General Appliance Corp., president; Douglas Peck, Peck Electric, Provo, vice-president; Dale Brown, J. R. Christensen & Associates, secretary-treasurer; Carlos W. Stone, past president; Robert O. Trottier, managing director. The directors include representatives from every branch of the industry.

Stone also announced that a cup had been donated to be given annually to that company doing the most in service to the industry through activities of the association.

Figures as to IEA growth since 1954 were given by Stone. Among them a membership increase from 256 to 375, of chapters from seven to 12, of adequate wiring certifications from 275 to 644, of Bronze Medallion Homes last year 281 and Gold Medallion 65.

Appropriately the afternoon session began with a talk on the "Total Electric Home" by J. G. McKinley, Westinghouse Electric Corp., San Francisco. He showed films of TV commercials and of a film presented at the builders' convention, then described the other promotional activities of the national manufacturers and associations to promote the total electrification of all new homes.

McKinley then conducted one of the workshops in discussion of local promotion problems on a Medallion Home program. De Lamar Holt was chairman of this session. The electric heat workshop drew the largest attendance surprisingly and a lively discussion of the various forms of electric heating and of the necessity for adequate engineering and insulation took place. Thomas J. Mellon, Wesix Electric Heater Co., San Francisco, participated. Chairman was Ted Brown.

Another workshop on advertising was chairmanned by George Larsen of Provo Utilities. Joseph Francom and A. Wayne Baker of Francom Advertising Agency, Salt Lake City, were the two chief participants.

A workshop on service and wiring

Carlos Stone, president, IEA, congratulates his successor, Walter Michelsen. Doug Peck, Provo contractor, new vice-president, seated at the right of them

WHAT'S NEWS IN RUBBER

ENJAY DELIVERS 1,000,000th LONG TON OF BUTYL!

PRODUCTION FACILITIES INCREASED TO MEET CONSTANTLY GROWING DEMAND

There have been many elastomers developed since the first commercial ton of Butyl was used in 1943, but no other rubber, synthetic or natural, offers so many outstanding properties for so many applications.

Plant expansion plans announced recently will increase butyl production capacity some 50 percent by 1961 and, at today's rate of consumption, the two million-ton mark will be reached within the next six or seven years. Two new additions to the butyl product line, Chlorobutyl and Butyl Latex, will soon be available in commercial quantities.

VERSATILE ENJAY BUTYL'S OUTSTANDING PROPERTIES MAKE IT SUPERIOR TO OTHER RUBBERS FOR MANY APPLICATIONS. SOME ADVANTAGES:

- RESISTS TEAR AND ABRASION ... used in the new and revolutionary all-butyl tire.
- STANDS UP AT HIGH TEMPERATURE ... used in steam hose and tire curing bladders
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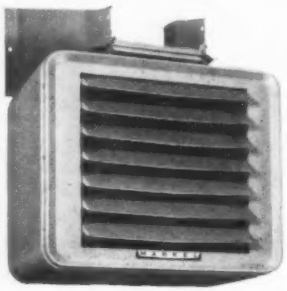

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28 STANDARD MODELS !
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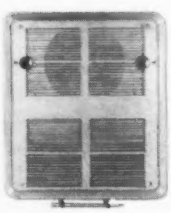

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problems was poorest attended but probably equally important to the others. Under Chairman Weber Hopkins of the new appliance and radio-TV service chapter of IEA and with A. R. Woolley, manager of Intermountain Chapter, NECA, as moderator, the hidden costs of service were discussed and then, finally, the new Salt Lake City Electrical Code. One of the chief hidden costs in service, Hopkins declared, was the rapid obsolescence of electronic parts. Woolley made pointed observation that people in the industry wasted great amounts of time discussing noncontrollable items of cost rather than working more on selling the value of their service. (For new Salt Lake code see p 82.)

The "Lamparade" of General Electric Lamp Division, Nela Park, was put on with customary showmanship at the evening banquet. With skillful demonstrations of new lamps and an ingenious presentation employing a new method of projection perfectly timed to Rodgers' talk proved an educational as well as an entertaining feature for the occasion.

The trophy for greatest cooperation and assistance to the IEA and industry was presented by President Stone to Doral Eardley, manager of the Graybar Electric Co., Salt Lake City branch. He had headed the attendance and registration committee, served on the general conference committee and had served the association throughout the year, Stone said. Registration exceeded 200 and attendance at the banquet 300, the largest meeting of the IEA to date.

► **The Washington Public Utilities Districts' Assn.** has elected the following officers: president, F. R. Jordan, Commission of the Pend Oreille County PUD; vice-president, W. F. Elmgren, Clark County PUD commissioner; treasurer, Robert Keiser, Chelan PUD.

The election followed a meeting at the New Washington Hotel in Seattle, with Gus Norwood, executive secretary of the Northwest Public Power Assn., as featured speaker. Norwood discussed the outlook for federal legislation and stressed the importance of bills now in Congress dealing with conservation of water resources.

He urged the delegates to lend their support to a bill to create a Joint Committee on Conservation, calling it desirable and necessary.

► **Appliance Parts Jobbers Assn.** will hold its 21st annual convention at the Dunes Hotel in Las Vegas, Nev., May 17-21, according to W. L. May of Portland, secretary.

Meetings Calendar

APRIL

11-12—*Pacific Coast Electrical Assn.*, Administrative Services, conference, Huntington-Sheraton Hotel, Pasadena.

20—*International Association of Electrical Inspectors*, Utah chapter annual meeting, Salt Lake City.

22—*IAEI*, Idaho Chapter annual meeting, Twin Falls.

22-27—*San Diego Bureau of Home Appliances*, annual Spring Fair, Balboa Park.

24-27—*Rocky Mountain Electrical League*, spring conference, Harvest House, Boulder, Colo.

25-26—*Illuminating Engineering Society*, Intermountain Regional Conference, Mountain Shadows Resort, Scottsdale, Ariz.

27-29—*Northwest Electric Light & Power Assn.*, Engineering and Operation Section, Personnel & Safety Section, Florence Hotel, Missoula, Mont.

27-30—*Western Air Conditioning, Heating, Ventilation & Refrigeration* Conference and Show, Shrine Exposition Auditorium, Los Angeles.

MAY

2-6—*Western Joint Computer Conference*, San Francisco.

3-5—*Illuminating Engineering Society*, South Pacific Regional Conference, Hollywood Roosevelt Hotel, Los Angeles.

9-10—*IES*, Pacific Northwest Regional Conference, Benjamin Franklin Hotel, Seattle.

9-12—*National Electrical Contractors Assn.*, District 5, and IBEW, District 7, joint meeting, Westward Ho Hotel, Phoenix.

9-12—*NECA*, Tri-District (Districts 6, 8, 9) regional conference, Olympic Hotel, Seattle.

16-18—*Pacific Coast Electrical Assn.*, annual convention, Stardust Hotel, Las Vegas.

17-21—*Appliance Parts Jobbers Assn.*, annual convention, Dunes Hotel, Las Vegas, Nev.

19-20—*Northwest Public Power Assn.*, Engineering & Operations Section, annual meeting, Elks Lodge, Port Angeles, Wash.

23-25—*Northwest Electric Light & Power Assn.*, Business Development Section, Chinook Hotel, Yakima.

24-26—*Institute of Radio Engineers*, seventh regional conference, Olympic Hotel, Seattle.

JUNE

15-17—*Northwest Electric Light & Power Assn.*, Accounting & Business Practice Section, Hotel Benson, Portland.

15-17—*National Conference of Utility Radio*, Continental-Denver Motel, Denver.

16-17—*Oregon Rural Electric Cooperative Assn.*, annual meeting, Gearhart Hotel, Gearhart, Ore.

don't let the numbers fool you

The hi-pot rating of a photoelectric streetlight control (the maximum *sustained** voltage it can take between its electrical and mechanical connections without breakdown) is important. If the hi-pot isn't high enough, the control may be an unexpected weak link in the system, behaving like a fuse instead of a switch.

Naturally the hi-pot rating of a control should be qualified by a description of the test method used. When a high, stiff voltage is applied to the control and "ground", the test is honest—but dangerous. A common practice is to insert a current-limiting resistor (on the order of 10 megohms) to take care of the danger—but then even a little leakage in the control will cause a big drop in the applied voltage, with the result that the hi-pot rating is falsely high. The voltage at the control is substantially less than the applied voltage as read on the meter, just as the indicated weight of the buoyed-up boy in the picture is less than his actual weight.

To get a "true" hi-pot rating, we eliminate the resistor and carry out the test in an insulated box which provides the necessary protection. Thus the voltage read on the meter *is* the same as that across the control. The new F-P bakelite-chassis 6600A controls will withstand a hi-pot test of at least 9 KV—honest. The Fisher-Pierce Co., 43 Pearl Street, So. Braintree 85, Massachusetts.

*as contrasted to "flash-over" effects caused by extremely brief, high voltage peaks.

FP

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PHOTOELECTRIC LIGHTING CONTROLS

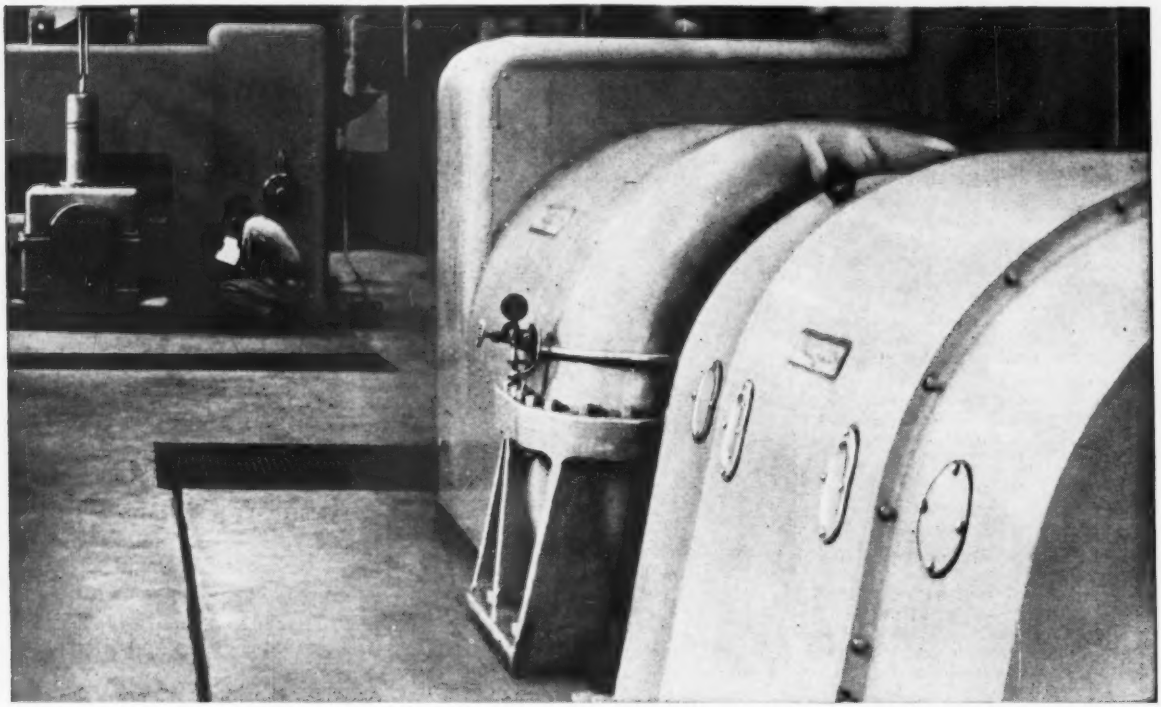
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

STANDARD ENGINEER'S FIELD REPORT

PRODUCT **CHEVRON OC TURBINE OIL**

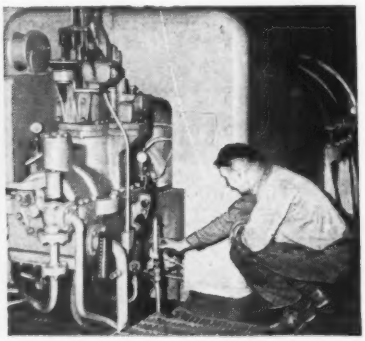
FIRM **Southern Utah Power Co. Cedar City, Utah**

After 70,918 hours, Oil Neutralization No. only .01!



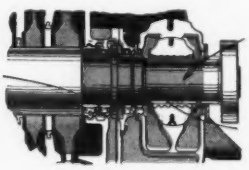
Latest analysis of Chevron OC Turbine Oil in these two Westinghouse steam turbines at Southern Utah Power Co. shows oil to be in virtually new condition. Neutralization number was just .01, and all other characteristics measured were equally satisfactory.

At time of sampling, 2,500 KW turbine (in foreground) had run 70,918 hours, 5,000 KW unit (at rear) 31,670 hours. Neither unit has required sweetening since initial charge of Chevron OC Turbine Oil (formerly called Calol OC Turbine Oil).



Steam Plant Superintendent Ralph Jones (left) explains how changes in load automatically control boiler's induced draft fan through this fluid coupling. Chevron OC Turbine Oil has given excellent service as hydraulic fluid in this coupling. At right, Mr. Jones checks oil temperature on smaller turbine. This unit went into service in 1945, the larger one in 1951.

Why Chevron OC Turbine Oil prevents sludging, rusting and wear



- Excellent metal wetting ability keeps oil on bearings and gears under heaviest loads
- Oxidation inhibitor prevents sludge, gum and lacquer formations
- Corrosion inhibitor prevents rusting

For More Information contact your Standard Engineer or Representative, or write 225 Bush Street, San Francisco 20, California

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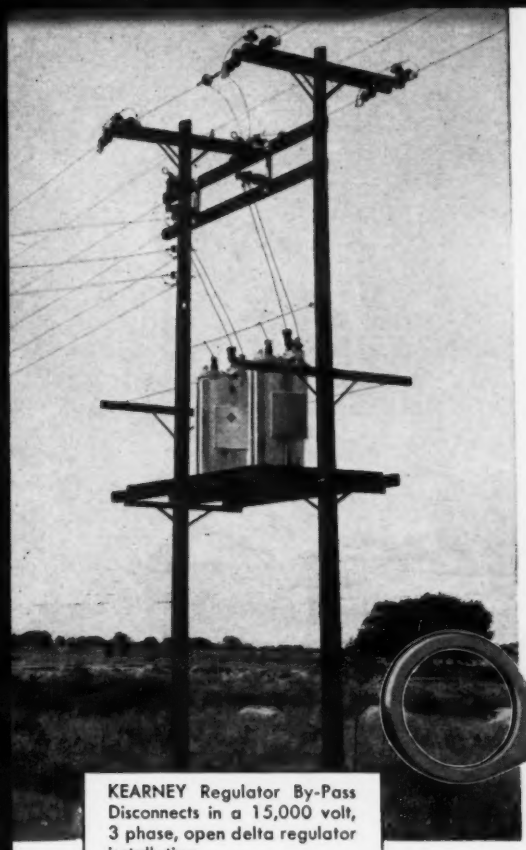

KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

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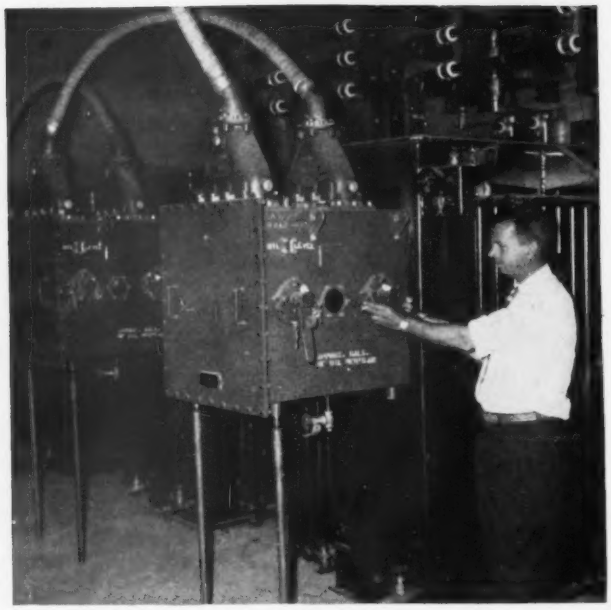
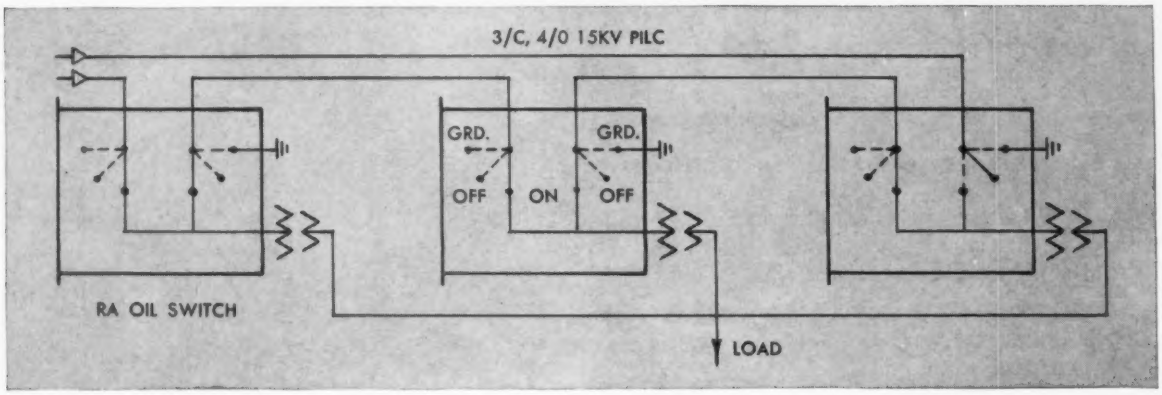


LOOP AROUND COSTLY SERVICE INTERRUPTIONS



Expensive service interruptions to a large building are minimized by looping feeder cables through G&W RA oil switches. The load is supplied by a southern utility through two feeders and three 3 phase transformers. Any two transformers or either feeder cable can carry the load for a short time. Looping the feeder cable through the oil switches (attached to transformers) permits disconnecting and grounding the feeder cables and interconnecting cables. The RA manually operated switch will safely break a full 400 ampere load at 15000 volts.

An economical RA load break oil switch is made to suit your distribution system plans. Consult a G&W representative about it.

VOLTAGE CHARACTERISTICS

voltage rating	60 cycle withstand dry	impulse withstand 1½ x 40 wave
7.5kv	36kv	95kv
15.0kv	50kv	110kv
23.0kv	70kv	150kv
34.5kv	95kv	200kv

CURRENT CHARACTERISTICS

ampere rating	switch	amperes	
		momentary	4 seconds
400	standard	20,000	15,000
	special*	30,000	19,000
1000	standard	40,000	35,000
	special*	50,000	40,000

*silver inlaid contacts

G&W ELECTRIC SPECIALTY CO.
3500 WEST 127TH ST. • BLUE ISLAND, ILL.

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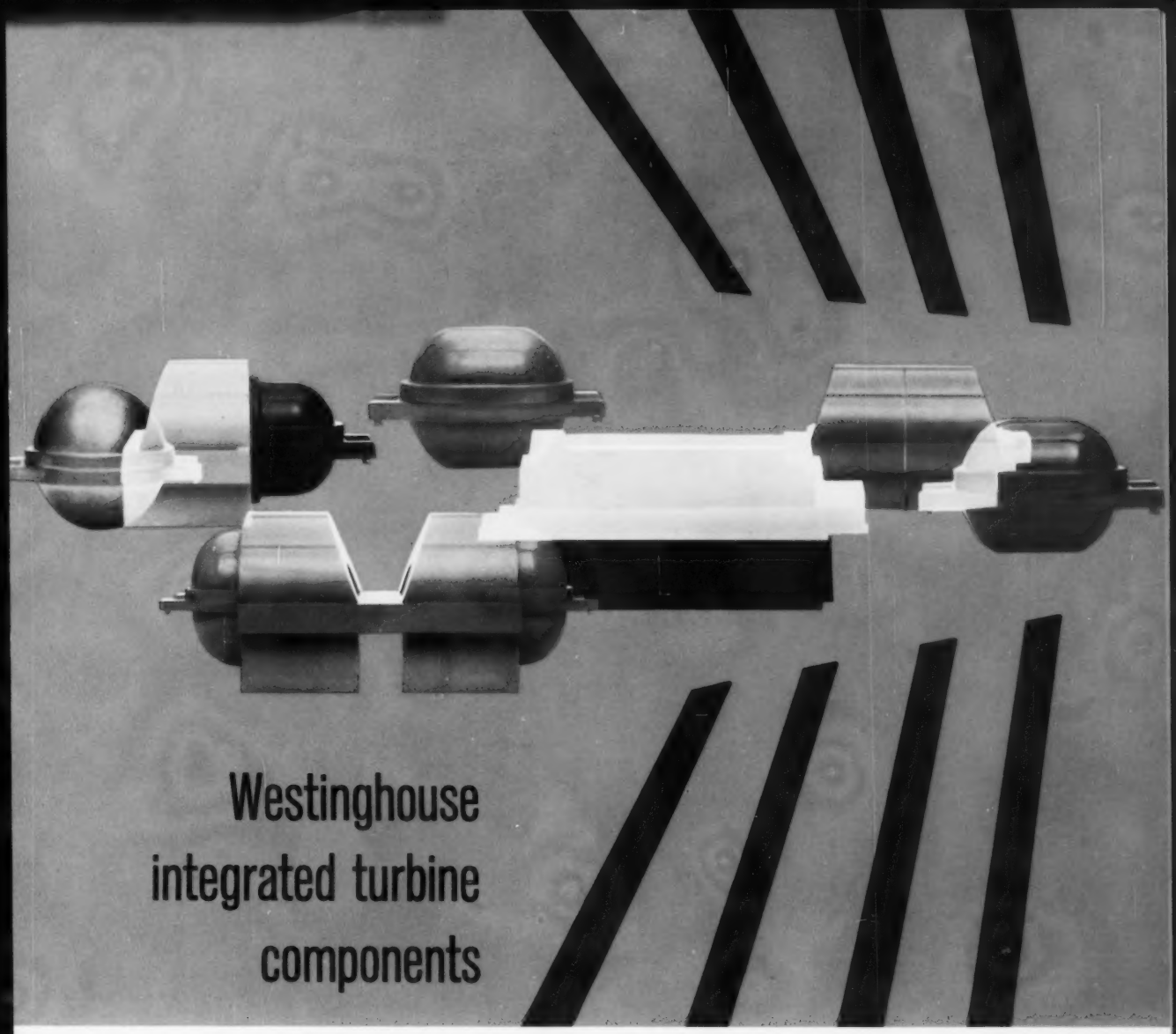
For phone number of closest representative see advertising index in back of book.



Westinghouse integrated turbine components

—major breakthrough to economical superload growth

Design flexibility, low maintenance, fast delivery, controlled costs, all in complex, high-capacity machines—these are the barriers which Westinghouse Integrated Component Design has overcome to meet the demands of the next 20 years.

Progress and development cannot cease at this point, however. Electric utilities, and the manufacturers who supply their needs, will continue to face the challenge of constant load growth indefinitely into the future.

In past reports, we've discussed present progress leading to a capacity of 600 million kw by 1980. We've also shown how Integrated Component Design has freed designers and scientists for the vital development projects described on the following pages. Even now underway, these projects promise further assurance of helping you meet your future power needs economically.

YOU CAN BE SURE...IF IT'S Westinghouse

integrated components assure continued advances in design efficiency and economy

Pre-engineered turbine components will free creative man power needed to carry on the development programs in metallurgy, thermodynamics and mechanical design which will lead to continued advances in turbine efficiency and economy.

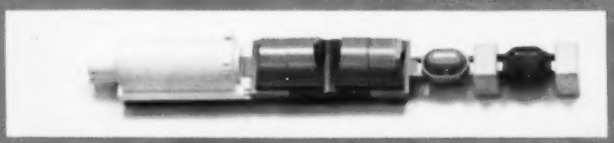
ADVANCED THINKING ALREADY AT WORK ON TOMORROW'S DEVELOPMENTS

As a result of progress in mechanical and thermodynamic design projects, designers have already proceeded with layouts of 3600-rpm elements using a new 28-in. last-row blade.

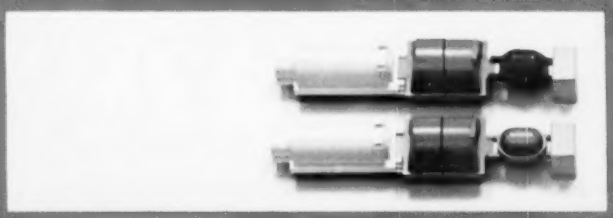
This design, used on a recent 325-mw cross-compound unit, promises to reduce size and weight. Designers plan to adapt the 28-in. low pressure elements to all the turbines shown below by merely modifying existing elements to reflect this latest design advance. Each unit arrangement is given a complete design analysis to determine its feasibility.

These improved blades will contribute to the achievement of ratings as high as 1500 mw, and steam conditions of 6000 psi at 1200° F.

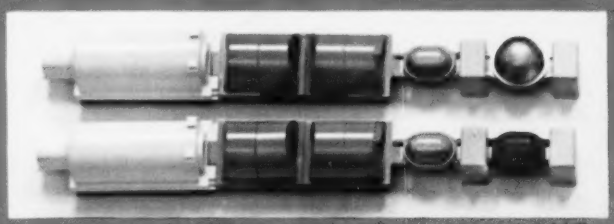
Tandem-compound two-flow



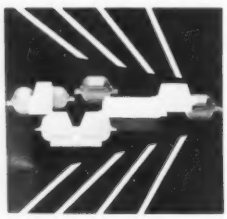
Tandem-compound four-flow

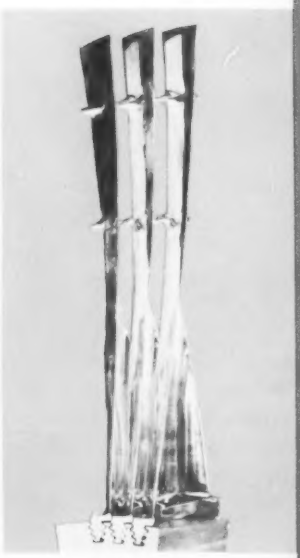


Cross-compound four-flow



Cross-compound eight-flow





28-inch blades

MORE EFFICIENT STEAM FLOW

The air-flow test models shown here in the Steam Division Laboratory (right) are used to simulate the flow of steam through portions of the turbine. From these experimental studies, pressure losses are progressively reduced.

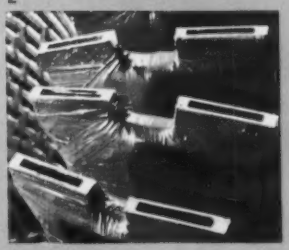
The model shown at lower right illustrates a new concept in crossover piping economy. The pipe-within-a-pipe arrangement maintains low pressure drop, while economizing on materials and space. Exhaustive tests on this model have proven the effectiveness of the arrangement.

These and other projects and a planned facilities expansion amounting to nearly 25 million dollars, are your guarantee of capacity to meet all your power needs economically.

Westinghouse is now designing generators of 512-mva capacity

1

2



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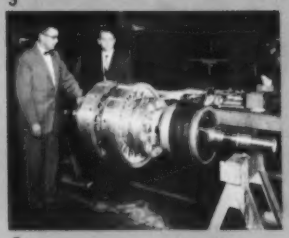


5

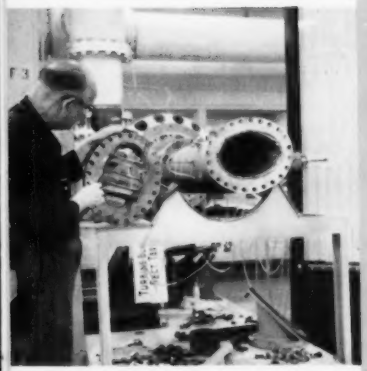
Current research into metals, new excitation systems, and many other advanced materials and methods are making it possible *now* for Westinghouse to match a generator (1) to any turbine of the future.

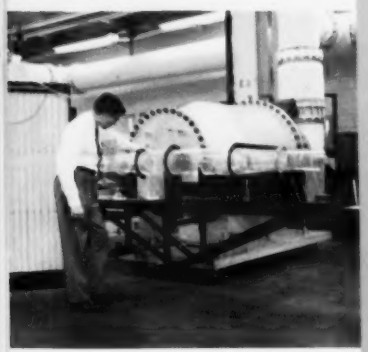
Two basic breakthroughs have been responsible for today's giant capacities—Thermalastic® insulation (2) and Inner-Cooling (3). These exclusive advances have opened the door to future capacity developments.

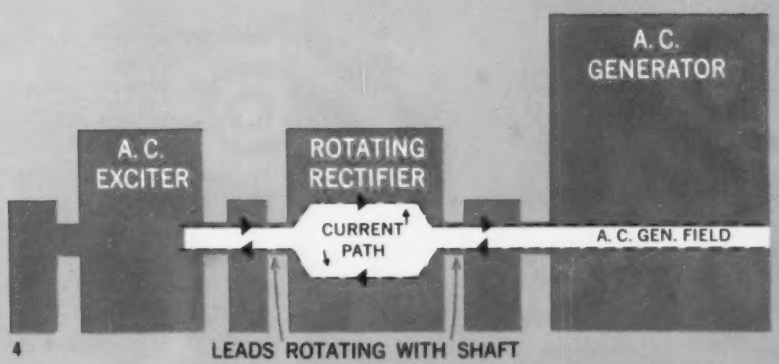
Excitation systems also are undergoing revolutionary changes (4). Current-collecting parts such as commutators, collector rings and brushes, which require removal and replacement, may disappear entirely through the use of silicon semiconductors. These semiconductors act as rectifiers and will enable us to substitute an a-c generator for the conventional d-c exciter. Such a system is now being assembled (5).

Other projects include the search for better steels, alloys and compositions; electrical sheet steel with better magnetic properties in all directions; Thermalastic insulation; and a host of other developments.

The advanced studies going on in Westinghouse laboratories will prove vital in helping you meet future power needs economically.







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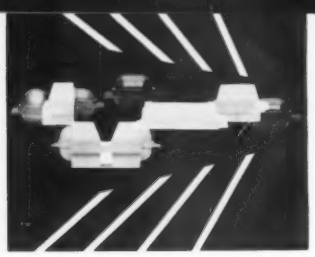
YOU CAN BE SURE...IF IT'S Westinghouse



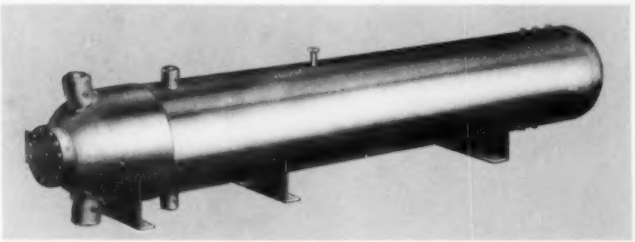
heat transfer apparatus progress keeps pace with turbines and generators

The design flexibility of Westinghouse condensers, coupled with a full line of auxiliaries, makes it possible even today to design them to the Integrated Component practice now in use with turbine-generators, thus giving highest efficiencies at lowest cost.

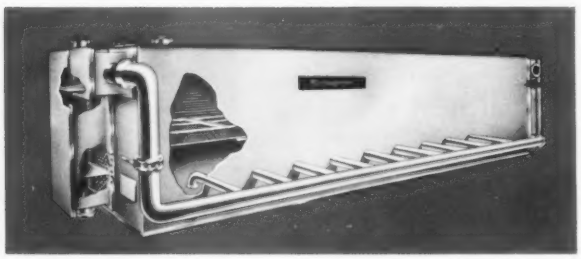
Continuing research and development for even greater improvements in the future are proceeding in the heat transfer area, too.

RESULTS OF CURRENT RESEARCH

In the realm of present, practical developments resulting from Westinghouse research, two innovations stand out prominently.

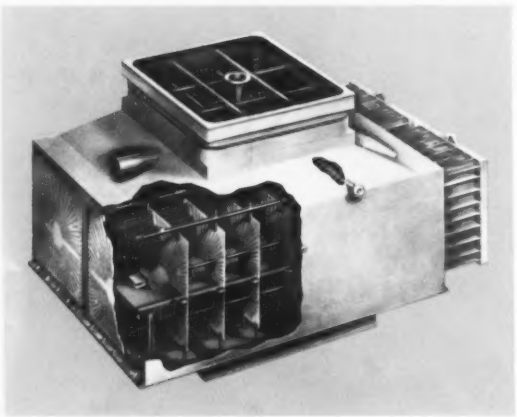


New high pressure feedwater heaters are a direct result of research and development in nuclear steam generators. The new hemispherical, welded head, high pressure unit is especially adapted to the increased temperature and pressure requirements of the large turbine steam cycle. In designing more efficient, economical generating equipment, Westinghouse has developed welding techniques to meet extreme conditions of temperature and pressure.



The flash evaporator provides a low-cost means of making ultrahigh purity water for boiler feed make-up from either fresh or salt water. This minimizes any thermal loss to turbine heat rate, and reduces initial cost of the power plant.

These, and many more, developments are your further assurance of the industry's soundest power generation equipment investment.



DEVELOPMENT PROGRAMS NOW IN PROGRESS

LOWER COST FOUNDATIONS—Westinghouse research and development engineers are exploring new structural designs that promise to lower the weight and size of surface condensers and result in lower foundation costs.

DROPWISE CONDENSATION FOR IMPROVED HEAT TRANSFER—Westinghouse is evaluating water repellents which show promise of keeping the tubes nonwettable throughout the life of the condenser. This will result in improved heat transfer rates and permit a reduction in size, weight and cost.

MATERIALS FOR LONGER LIFE—In the Westinghouse Steam Development Laboratory, engineers are busy studying ways to prolong the life of waterboxes and pump components by utilizing newly available materials and protective coatings.

REDUCTION OF AERODYNAMIC LOSSES—Westinghouse engineers are probing means of reducing all the interrelated causes of aerodynamic losses in the transition section between the turbine and the condenser. This will result in design changes which will give the industry condensers that are not only smaller, but more efficient.

As a result of progress already made, Westinghouse is ready now to help you plan, design and build complete generating stations with built-in expandability to meet all future power needs economically. Call or write Westinghouse Electric Corporation, Steam Division, Lester Branch P.O., Philadelphia 13, Pennsylvania. J1-50612

YOU CAN BE SURE...IF IT'S

Westinghouse

Litho in U.S.A.

Holan heavy duty Elbow does double duty as derrick

Lifting workmen high into the air—or out—or down is only one of the uses of the Holan Elbow.

Equipped with an optional winch, the Elbow becomes one of the most versatile derricks in the field. It can be used for setting poles or lifting heavy loads and can be operated from either side of the body or the rear.

Because of 360° continuous rotation of the mast, the Holan Elbow used as a derrick can be located in any number of positions without moving the truck. This saves time — and money — in construction and maintenance work requiring derrick operation.

The winch can be installed on any of the three Holan Elbows: HD-42, HD-50 or HD-55. It will lift 4,000 pounds and set poles up to 65 feet in length.

Mounted on the mast, the winch is hydraulically driven from the Elbow hydraulic system with power from the power take-off or from a separate gasoline engine.

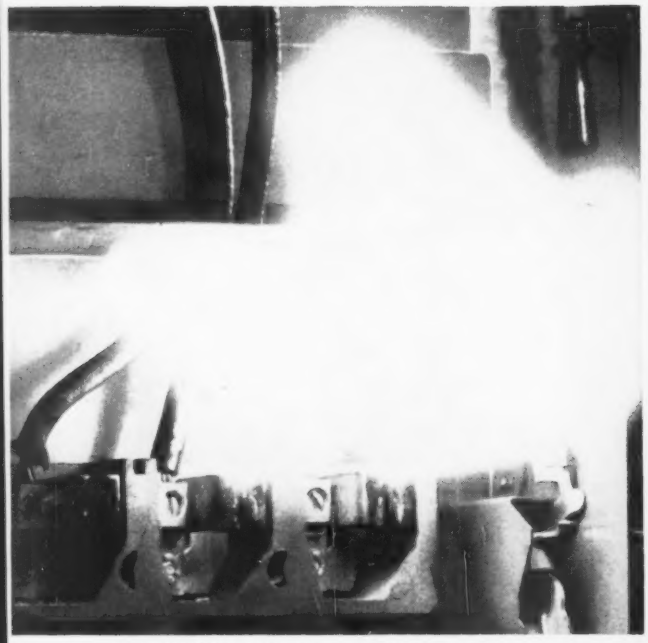
In the Holan Elbow you have an aerial elbow that reaches up as high as 55 feet and a serviceable, versatile derrick *—all in one.* Write us for complete details—or get in touch with your Holan Field Representative.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

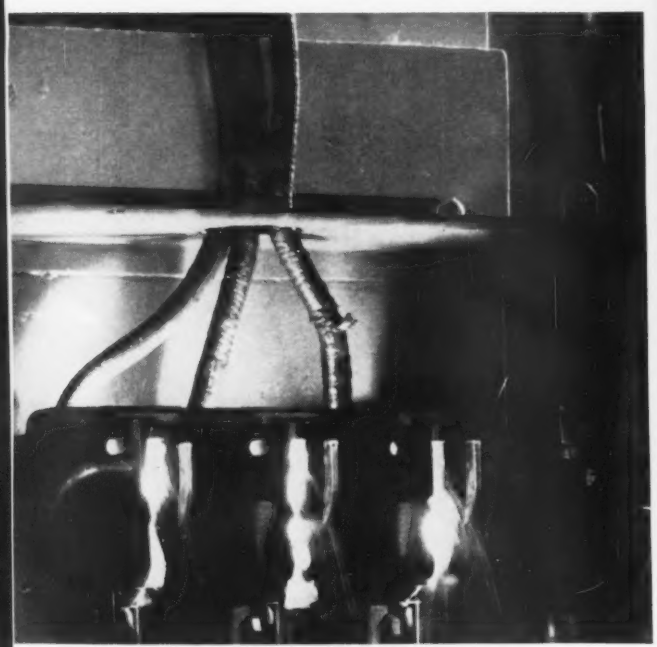
Holan
Subsidiary of THE OHIO BRASS COMPANY
HOLAN

For phone number of closest representative see advertising index in back of book.

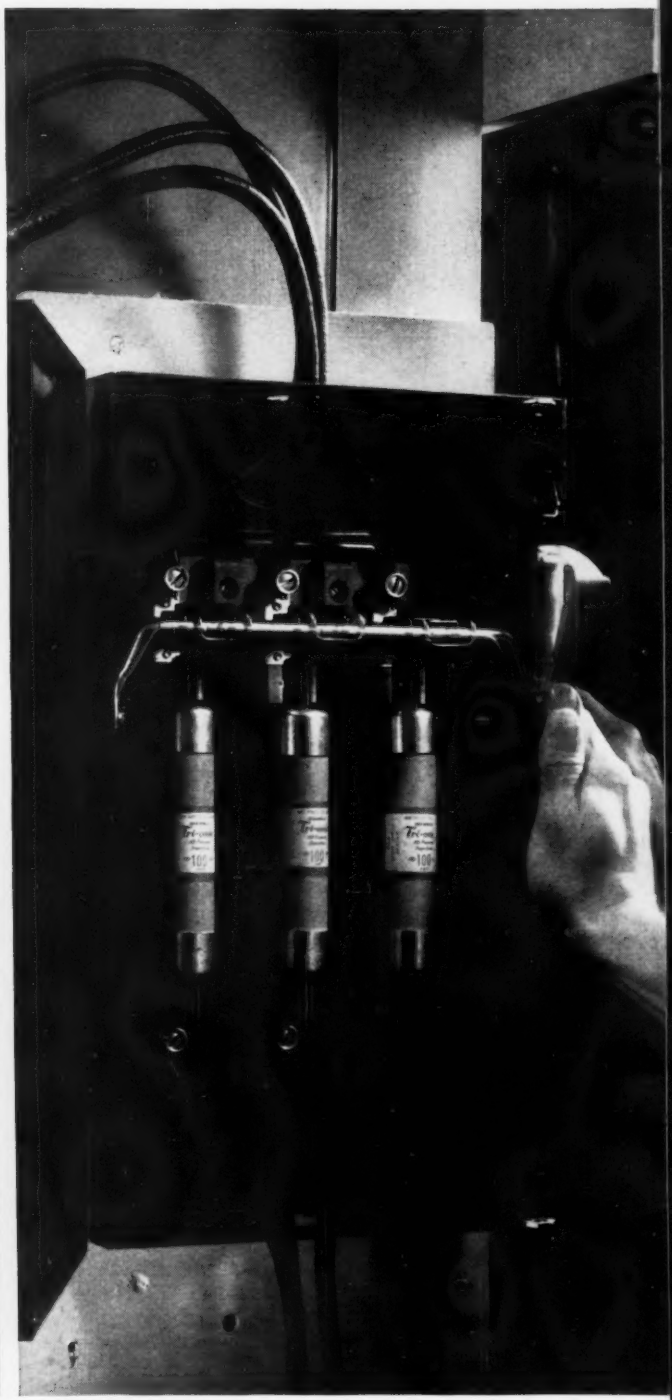
FOR SAFETY'S SAKE:



1. RUINOUS ARC in open knifeblade switch. At moment of "break" a flash explosion occurs. Blades pit, burn, deteriorate. Danger of fire is ever-present in open blade switches.



2. SUBDUED ARC in modified knifeblade switch. Closures or "quenchers" retard arcing slightly, but since blades must ultimately be pulled clear of closures the hazards still exist.



3. MAXIMUM SAFETY found only in BullDog Vacu-Break* Safety Switches. Arcing is confined inside compact Vacu-Break chambers. Arcs are snuffed out before they can cause any serious damage.

Unretouched photographs of the arc in 100-amp 600-volt switches operating under 90-amp 440-volt load with 40% to 50% power factor. All pictures taken at exact instant of "break."

HERE'S THE REAL STORY ON SAFETY IN SAFETY SWITCHES

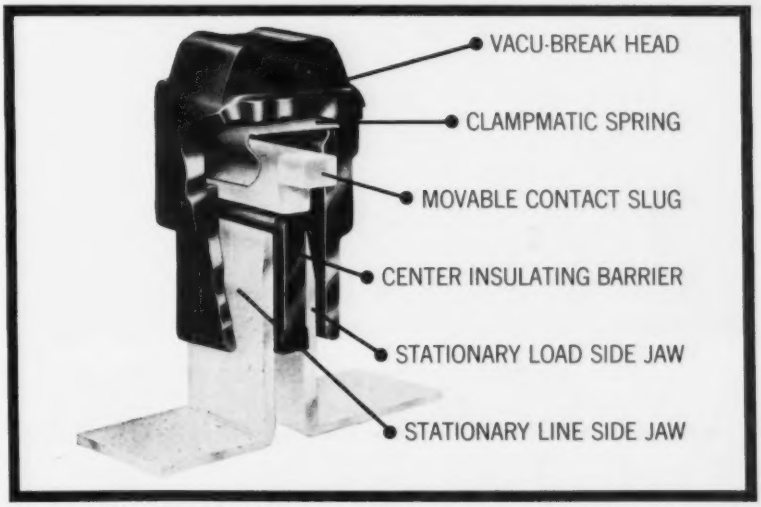
There's a big difference in safety switches—a difference between maximum safety and half-way safety . . . low maintenance and excessive maintenance. These differences are quickly apparent when you compare BullDog Vacu-Break® Safety Switches with the other main type—the open knifeblade switch.

BULLDOG discarded the knifeblade design twenty years ago when they engineered the Vacu-Break. It is based on the engineering principle that an arc is the least destructive or dangerous if confined in an arc chamber which limits the oxygen supply . . . actually starves the arc before it can build up. "Explosions" are non-existent . . . the need for maintenance of contact points is virtually eliminated. Today, only BullDog has the Vacu-Break or anything like it. And it is available at no extra cost on both the Master and Junior and Raintight lines.

OPERATION of the Vacu-Break is simple, sure and safe. A sturdy rod attached to the operating handle is clamped directly to the Vacu-Break heads. When the handle is pushed "Off," this rod literally yanks the heads away from the stationary contacts. *Double "break" action is quick, foolproof.* Unlike knifeblade types, you need not depend on tricky spring and trigger mechanisms. You don't have to open the switch cover and check to see that contact has been broken!

100,000 AMP TEST. BullDog Vacu-Break Safety Switches, when used with current-limiting type Amp-Traps**, will withstand the most severe fault currents. In recent tests standard BullDog switches with Amp-Traps have been subjected to a 100,000 amp short circuit current. *The switches were undamaged!*

THE CLAMPMATIC* ASSEMBLY (see the illustration below) is another safety feature of BullDog Vacu-Break Safety Switches. It gives bolt-tight contact in the "On" position, helps accelerate "break" when the switch is pushed "Off." You provide real value, too. Vacu-Break Safety Switches cost no more. Compare!



Close-up of Vacu-Break head shows movable contact slug inside the compact, oxygen-limiting chamber. Clampmatic assembly assures bolt-tight contact, speeds "break." This combination guarantees positive, safe operation, long switch life.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan.
In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

* *Vacu-Break and Clampmatic are registered trademarks of the I-T-E Circuit Breaker Company.*

** *Amp-Trap is a registered trademark of the Chase-Shawmut Company.*

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7866
Portland 12, Oregon

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

BullDog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

FOR SAFETY'S SAKE—BUY VACU-BREAK

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

New ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 3½", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. WE-40 for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York • Newark, California
Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products

FLINTKOTE

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GG
Ground Rod Clamp
Socket set screw

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

Available Through Electrical Wholesalers Everywhere

DISTRIBUTED ON THE WEST COAST BY

KORTICK MFG. CO.

JASPER BLACKBURN CORPORATION

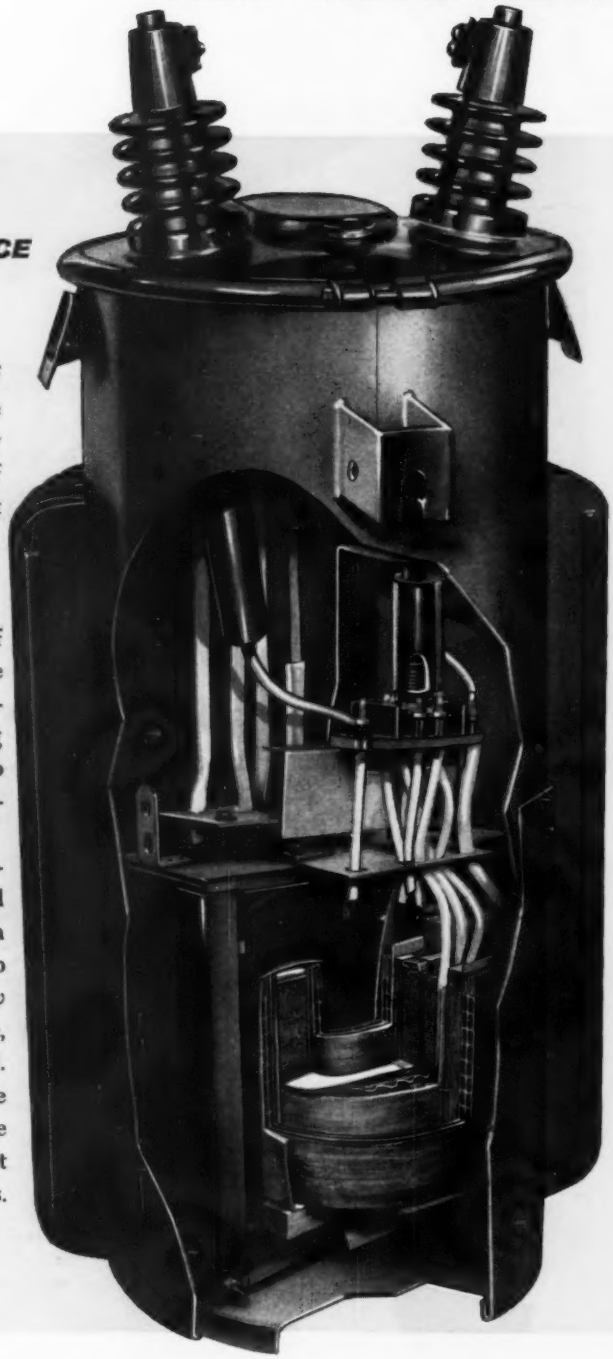
ST. LOUIS 14, MO.. WYDOWN 3-9430

1525 WOODSON RD.

For phone number of closest representative see advertising index in back of book.

Get the most for your

with WAGNER



MORE FOR YOUR MONEY IN ELECTRICAL PERFORMANCE

CORES WITH LOWER LOSSES

Wagner Form W cores are made of highest quality annealed steel, and are skillfully constructed to provide a low reluctance path for the magnetic lines of force to keep losses and exciting current low.

COILS WITH LOWER IMPEDANCES

Wagner Form W coils are wound of carefully selected and tested copper wire or strip. Layer, channel and barrier insulation is coated with a thermo-setting material that bonds the coil structure into a mechanically strong, electrically efficient, quiet-operating unit.

Recent Wagner engineering developments in the method of insulating and winding coils of pole type distribution transformers have made it possible to provide impedances from 10% to 15% *below* present impedances. At the same time, short circuit strength is greatly increased. Short circuit tests, with full line voltage applied, prove that these transformers are capable of withstanding short circuit stresses far in excess of industry standards.

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

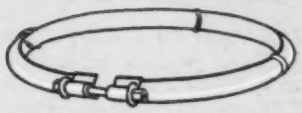
distribution transformer dollar

FORM W TRANSFORMERS

At Wagner, research and development teams are constantly working on distribution transformer improvements. They are testing new methods and materials . . . developing new design concepts . . . in a constant search for improvements that will give you the most from your distribution transformer investment. The result: better electrical performance . . . longer lasting parts . . . improved mechanical features—to give you all the characteristics you want in transformers for your distribution system.

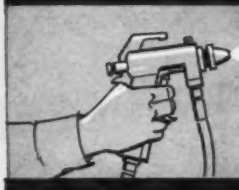
A complete line of Form W pole-type transformers, from 3 to 167 kva, 15 KV and below, is available from factory, branch, and distributor stocks. Consult your Wagner Sales Engineer about your transformer requirements, or write us.

MORE FOR YOUR MONEY IN MECHANICAL FEATURES:

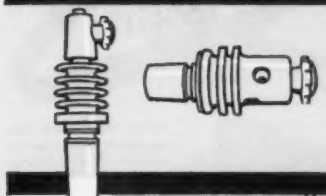


SHUR-SEAL CLAMPING RING

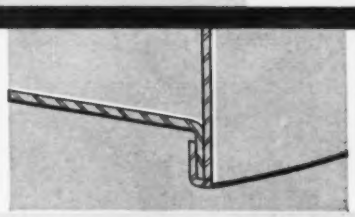
Holds cover to the tank with an airtight seal . . . no atmospheric moisture or dust particles can get inside to contaminate the oil and shorten transformer life. No oil can leak out during shipping or handling. Cover may be removed by loosening a single bolt.



LONG LASTING TANK FINISH. A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.



SAFETY KEYED BUSHINGS. Heavy wet-process porcelain high-voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessons the chance for finish damage due to scraping.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6381 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT60-2

For phone number of closest representative see advertising index in back of book.

201—famous Klein Side Cutting Plier. Sizes 5, 6, 7, 8 and 9 in.

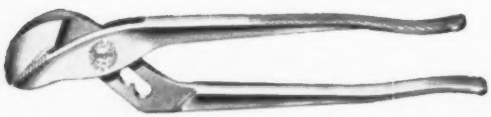
201-NE—rounded nose side cutting plier. Sizes 5, 6, 7, 8 and 9 in.

213-9NE—high leverage plier. Will cut regular and weatherproof hard drawn copper wire up to No. 2.

301—long nose plier. Available in 5-, 6- and 7-in. sizes. Also may be had with cutters.

202—narrow nose oblique cutting plier. Available in 5- and 6-in. sizes.

500—adjustable wrenches. 6, 8, 10, 12 in.



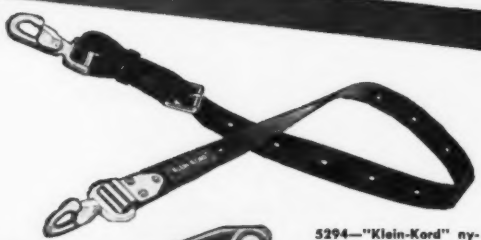
510—pump plier. One hand operation. Length, 9½ in.

KLEIN TOOLS EST. 1857 TRADE MARK

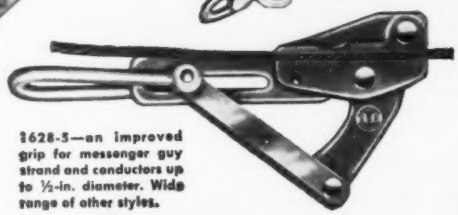
over a century of progress

Klein has been the leading supplier of tools and equipment to the electrical industry since the first wires were strung. It was over 100 years ago that Mathias Klein first opened his little forge shop in Chicago. Today the name Klein is known for quality the world over. From your Electrical Distributor, you can secure anything you need in tools and equipment for linemen and electricians. Below are a few of the popular Klein items available.

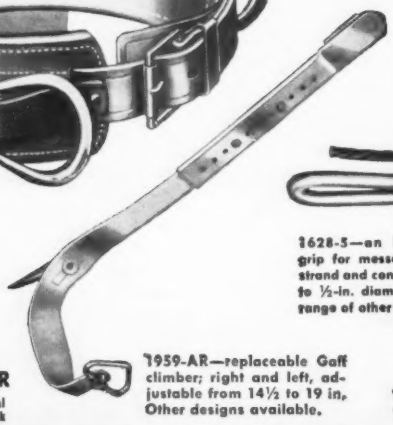
5249—linemen's belt. Full floating with "Klein-Kord" sliding trace. One of a complete line.



5294—"Klein-Kord" nylon safety strap made of multiple plies of strong, woven nylon bonded with frictioning and vulcanized in neoprene.



1628-5—an improved grip for messenger guy strand and conductors up to ½-in. diameter. Wide range of other styles.



1959-AR—replaceable Gaff climber; right and left, adjustable from 14½ to 19 in. Other designs available.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

This new Klein Catalog is just off the press. A copy will be sent to anyone interested on request.

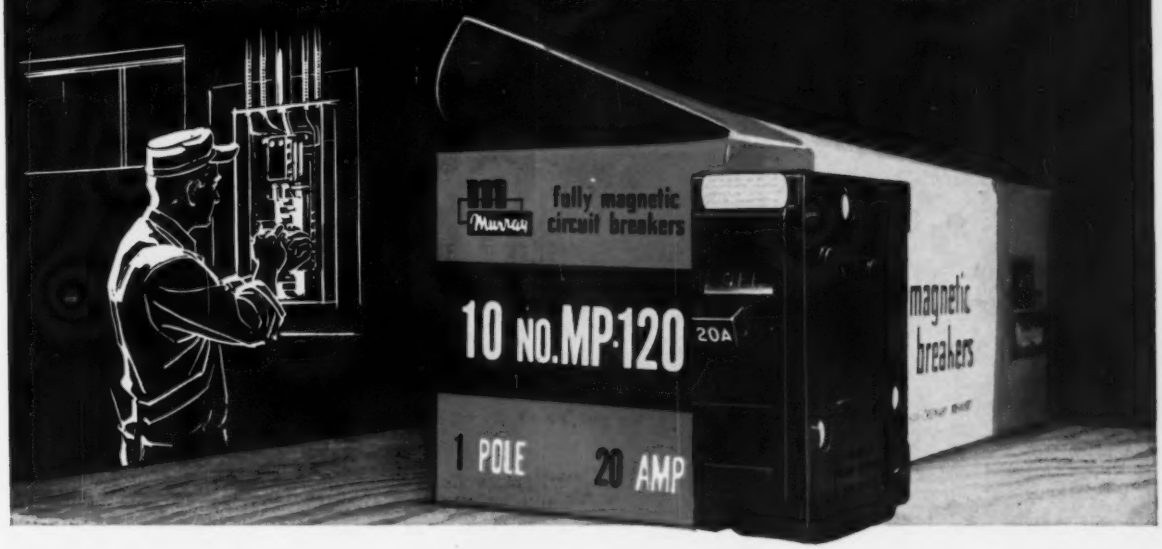
Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

For phone number of closest representative see advertising index in back of book.

fully magnetic, competitively priced . . . and now

GUARANTEED FOR LIFE

Murray "MP" Circuit Breakers



Build Business, Profits, Prestige!
Install the breaker that's best all around—best for you, best for your customers, and *Guaranteed For Life!*

You'll like working with "MP" breakers. *Fully magnetic* and unaffected by heat, these breakers never need derating, carry full rated load, never trip unnecessarily, can be installed anywhere it's most convenient for you or your customers.

Secondly, your customers will appreciate knowing that the breakers you install are *Guaranteed For Life.* It shows you're using the best, helps you get the business.

Extra Sales Aids For You!
You get a special Guarantee Certificate to leave with each customer plus a special sticker for your own promotion to use on each load center. This will boost your prestige, bring extra business your way.

Here's How You Can Cash In On This Guaranteed For Life Program!
See your Murray wholesaler today for full information on this precedent-breaking promotion. Ask him also about the material he has available to help you sell builders and homeowners on Murray *Guaranteed For Life* "MP" circuit breakers. Or write Murray directly for complete details.

60 YR. YEAR Murray

Backed By A Full Line Of Load Centers

Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn 16, N.Y.
Dept. G-4

Gentlemen:

A circuit breaker that's *Guaranteed For Life!* I'm interested. As soon as possible, send me complete information on everything.

Name_____

Address_____

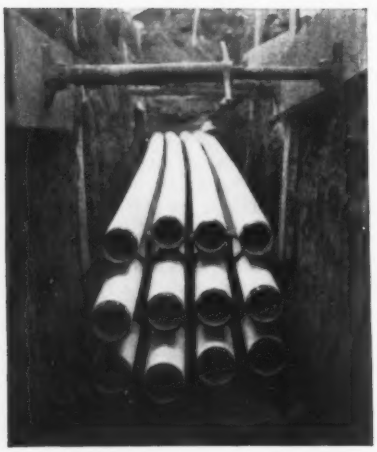
My wholesaler is_____

For phone number of closest representative see advertising index in back of book.

Get peak cable protection ***at lowest dollar cost***

Transite Ducts can be laid directly in trench without concrete envelope. Or if ductbank is to be concrete enclosed—thinner walled Transite Duct may be used. In all other respects both heavy-wall and thin-wall Transite Ducts are identical.

Transite Ducts save on the job and after!



No other duct material gives you so many installation and in-service economies

In every way, Transite® Ducts are the most efficient electrical ducts you can install. And—when assembled with J-M's Plastic Coupling—their cost is remarkably low!

One reason for this economy is in installation. Strong, lightweight, long—Transite lengths are easy to handle and install . . . Your men set the ducts in place easily, join them tightly in seconds. Transite's smooth bore is free of burrs and obstructions. Thus, long cable pulls are easily accomplished with no damage to cable sheathing.

You see another reason for Transite's economy in performance. Once in service, Transite's unusually high rate of heat dissipation means cables run cooler, last longer. Transite also confines arc damage . . . cannot burn, smoke or fume. It won't generate explosive or toxic gases. If arcing does occur, Transite Ducts won't sag or adhere to cable.

Let us send the Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JOHNS-MANVILLE JM PRODUCTS

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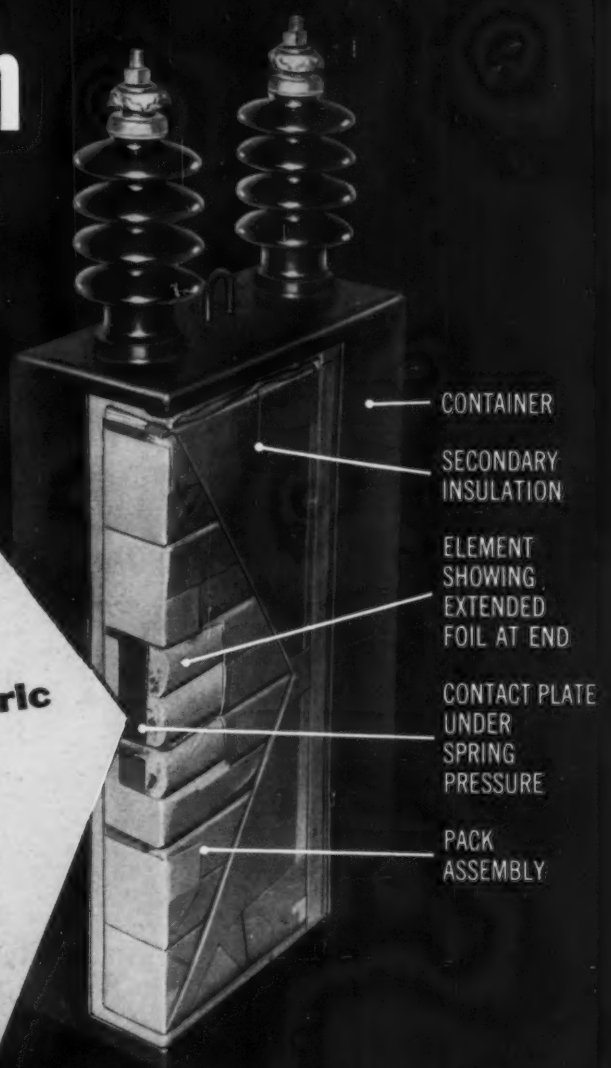
Exclusive with VAREX®



contacts are made outside the active dielectric under strong spring pressure

Varex is the *only* capacitor whose elements are totally free of mechanical insertions in the active dielectric!

Varex engineers have eliminated these mechanical insertions, or tabs, from the dielectric by means of the exclusive "extended foil" design. As shown above, every turn of foil extends beyond the paper dielectric and makes a broad contact with a plate under strong spring pressure.

This exclusive Varex design has thus removed a possible source of mechanical damage during winding, and a cause of higher electrical stress in the adjacent paper dielectric.

This means lower current density, cooler operation, and appreciably longer life for Varex capacitors!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10024-H

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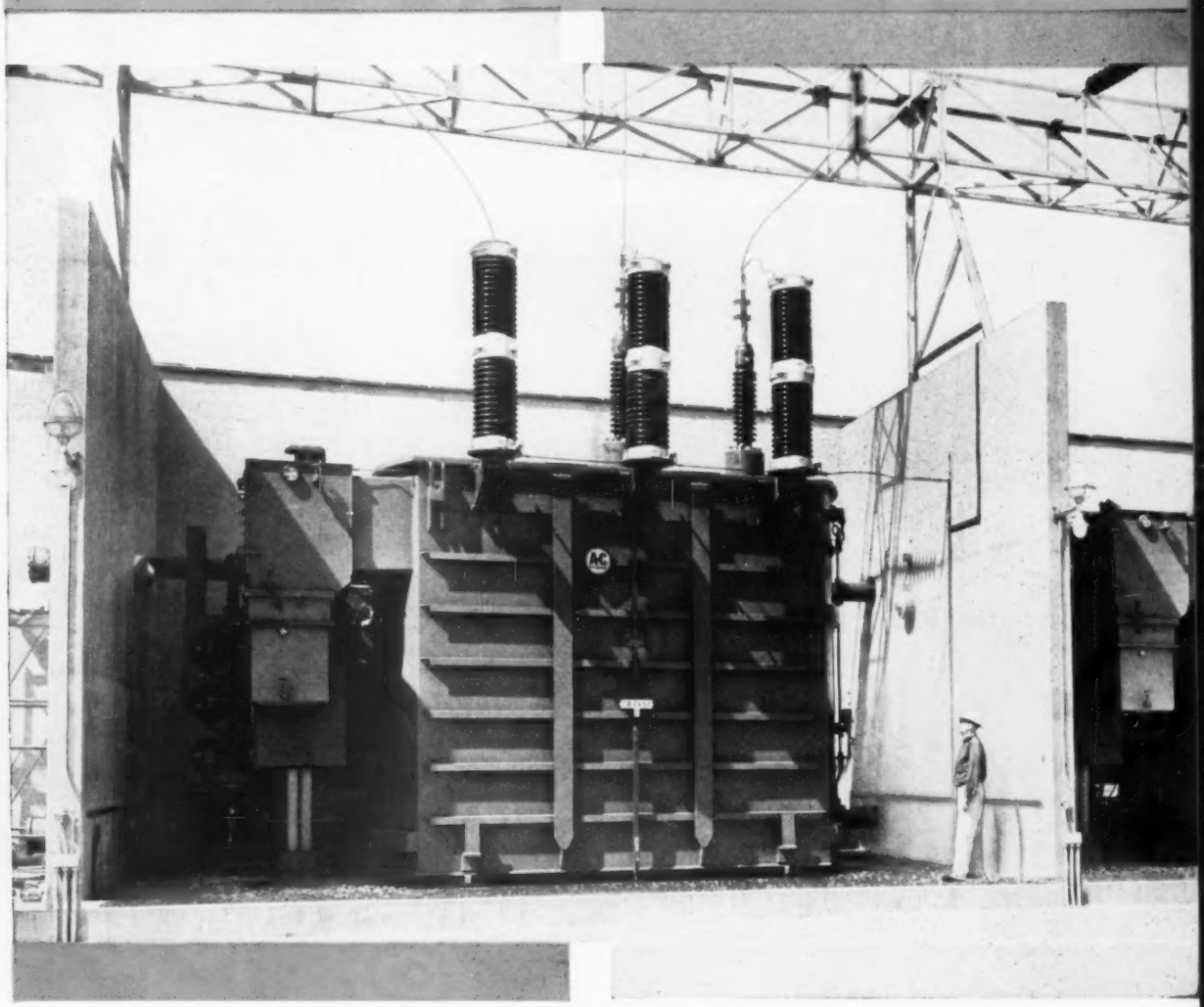
ALLIS-CHALMERS . . . Pacing

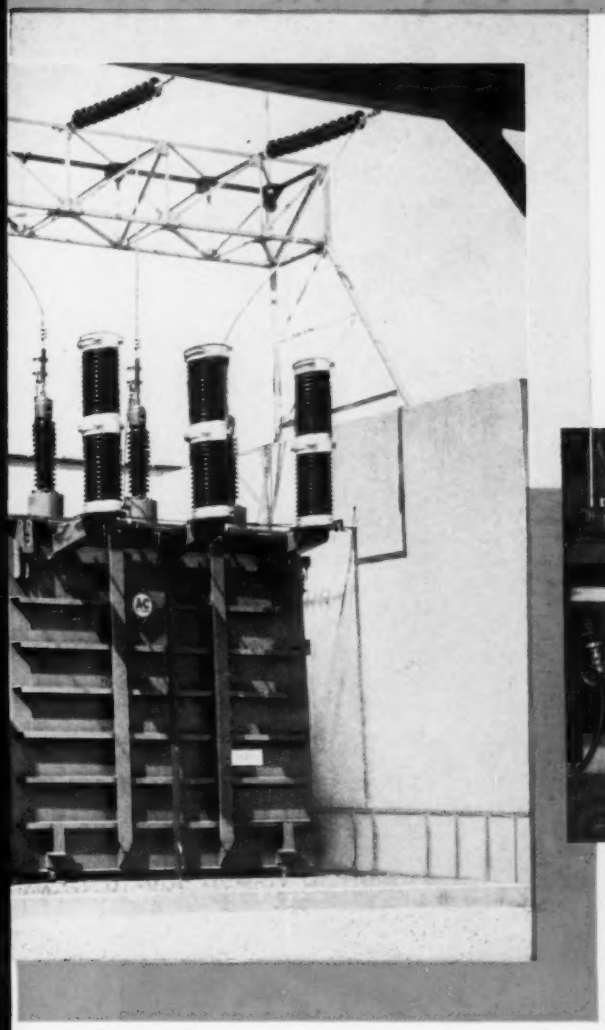


AT WISCONSIN ELECTRIC POWER COMPANY

Dual cooling takes the heat off emergency loads

*Patented

Power Progress



Manual shutoff valves serving transformer cooling equipment piping are opened when dual cooling is necessary. A transformer can be taken from service without draining the oil from the unit or its piping.

A-1155-E

Either of two 90-mva transformers is capable of carrying 2/3 of the combined capacity by using the "dual-cooled" feature

Wisconsin Electric Power Company counts on *designed-in* power transformer emergency capacity. Exclusive *dual-cooled* arrangement* uprates either one of the 90-mva transformers to 120 mva if the other is removed from the line.

The active transformer utilizes all of the other unit's oil-to-air cooling equipment to dissipate heat. In normal operation, each transformer uses its own coolers independently.

Stepping down 138,000 volts to 13,800 volts, the transformer bank employs accordion-type expansion joints between transformers. Header pipes allow for manual cutoff. The installation has been designed to permit adding a third transformer should demand require it.

Dual cooling is but one of many A-C advantages resulting from continuing transformer research. Others include corona-free design, quiet operation, reduced size and weight, high short-circuit strength. A call to your A-C man will bring further dual-cooling power transformer details.

ALLIS-CHALMERS A-C POWER FOR THE FUTURE

For phone number of closest representative see advertising index in back of book.

"By installing BERMICO CONDUIT at breakneck speed, we kept project work moving on schedule"

WILLIAM McCABE, Vice-President
Lord Electric Co., Portland, Oregon

Under construction. Lloyd Center, Portland, Oregon, one of the nation's largest metropolitan business-shopping developments, costing an estimated $30,000,000. 20,000 KVA initial power requirement.

"PRIME CONTRACTS for the Lloyd Center were let four months before the electrical contract," pointed out Mr. McCabe, Vice-President and Manager of the Portland office of Lord Electric Co. "By the time we were awarded our contract — the site was ready for the electrical conduit, so we had to move fast.

"Fortunate for us, Bermico was specified. By installing Bermico Conduit at breakneck speed, we kept project work moving on schedule."

Bermico Conduit is a great boon to electrical engineers, contractors and utilities. It is lightweight, easy to handle, simple to cut and assemble. Each 8-foot length is precision engineered, with smooth inside bore to allow easy pull-through without abrasion. Bermico is made from cellulose fibre, impregnated with coal tar pitch. It is extremely resistant to acids, alkalies, heat, water and corrosion — and of high dielectric strength. Use Bermico on *your* next job.

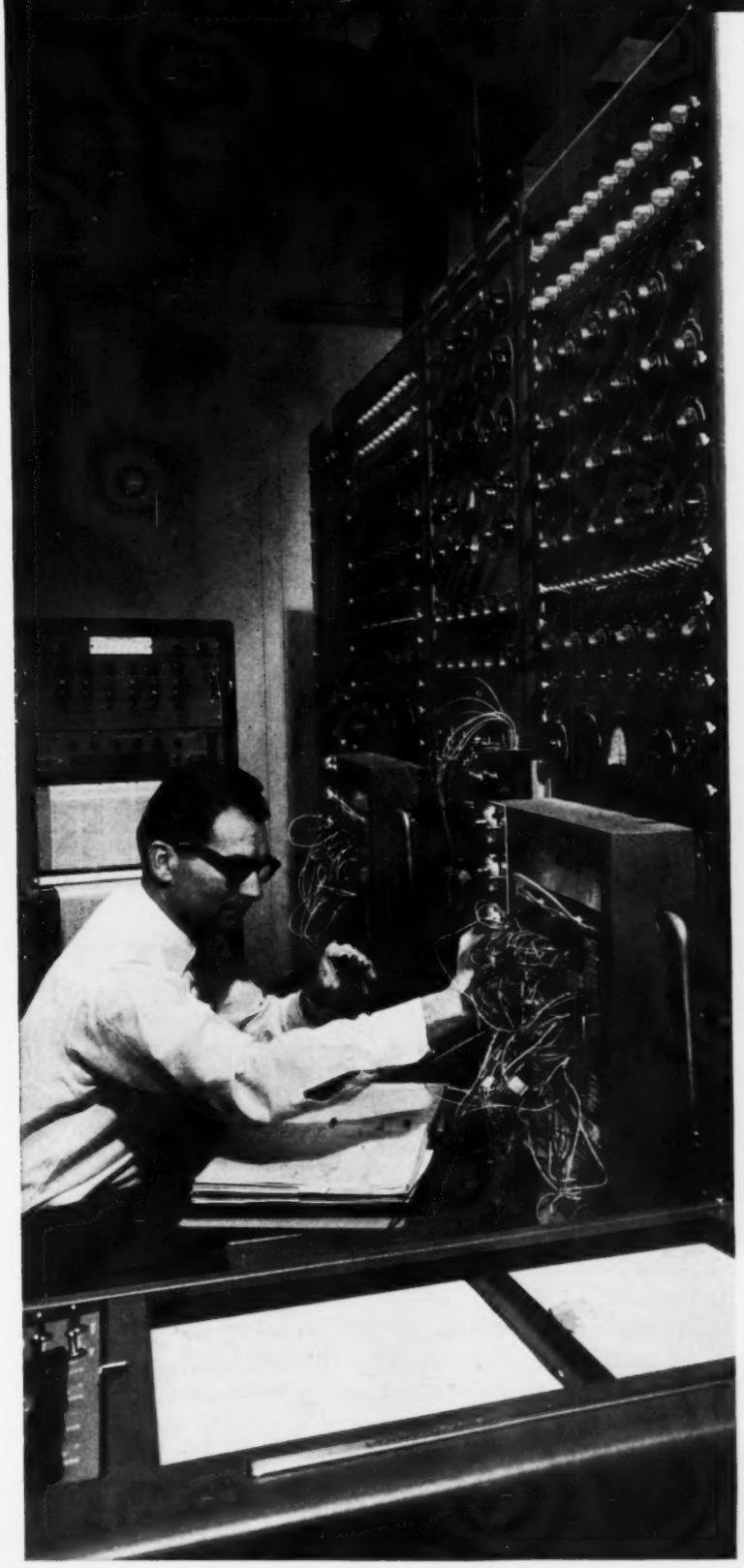
Distributed by WESTINGHOUSE Electric Supply Company and Agent Jobbers. Offices in Principal Cities.

Another quality product of

BROWN QUALITY COMPANY

681 Market Street, San Francisco, California — Dept. 1640

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



COMPUTER STUDIES BY GENERAL ELECTRIC PROVE . . .

Reduced Regulator Bandwidths Increase System Earnings

General Electric voltage regulators provide three added benefits to distribution systems through bandwidth reduction . . . extra feeder length, capacity, and revenue! New General Electric computer studies now prove that *reduced regulator bandwidths are practical* and that they result in increased distribution system performance with *no sacrifice of regulator life.*

Electric utilities have long recognized the desirability of bandwidths as low as ±¾ volts. The assumed stumbling block was the number of regulator operations. Through analysis of actual (as opposed to theoretical) data, new General Electric computer studies indicate that bandwidths of ±¾ volts are feasible from any standpoint, including that of equipment life.

Your General Electric regulator representative can show you the specific effects on regulator operation as bandwidths are reduced. He will show you how to determine if operations must be controlled . . . and if so, how to control them. Increase the return on your regulator investment, possibly with your existing equipment.

Take full advantage of the important benefits of General Electric ML-32 step regulators. Reduced bandwidths provide more *usable* kva on the line . . . permit increased loading of existing feeders. This easily attainable "power adder" can mean increased line length and capacity—important tools to reduce or defer investment. Reduced bandwidth settings make significant contributions to feeder revenue, too!

And contact your General Electric sales engineer for even more reasons why General Electric regulators cost less on the line! General Electric Company, Schenectady 5, N. Y. 456-02

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

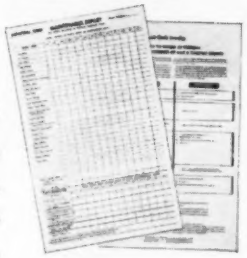
ELECTRIC FORK LIFTS:

...easier to maneuver...

no gear shifts...quiet...clean

...vibrationless...last longer...

cost less to run, maintain.



PROVE IT YOURSELF by keeping simple maintenance records. Handy record forms can be obtained by writing us in San Francisco (Room 410). Forms provide a convenient way to record your labor, parts and fuel costs. Compare your costs with any published reports on electric fork truck operating costs. You'll find the electric truck has proved much more efficient and economical.

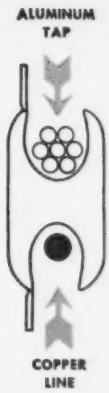
PG&E Service is your best bargain

P·G and E·

Pacific Gas and Electric Company

408-X-459

new! KEARNEY DOUBLE-TAB SQUEEZON

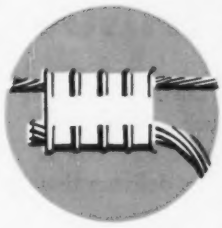


Exclusive Kearney design permits either groove to be used for line or tap. Diagram illustrates Double Tab Squeezon used to make an aluminum "step-up" tap to copper line connection.

NOW! The Easiest Way to Make Both "Step-Up" and "Step-Down" Tap Connections on All Combinations of Copper, Aluminum and ACSR

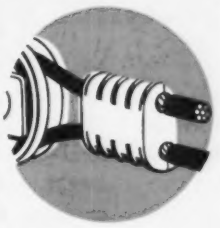
The newest, most versatile Squeezon Compression Connector. Dual, fully open groove design, exclusive with Kearney, eliminates need to thread tap conductor through fitting. Use *either* groove for line or tap . . . make "step-up" or "step-down" tap connections quickly and easily. Double Tab Squeezons speed up deadending, too. Form the loop . . . drop the conductors into the open grooves . . . and compress! On insulated wire, remove only a "Squeezon-length" of insulation!

Available in a range of size combinations for aluminum, copper or ACSR. (Write for Selector Card.) Individually packaged in handy "Snap-Open" boxes; grooves factory-filled with Kearnalex inhibitor and contact aid.



REVERSIBLE
The only compression connector with built-in spacer that makes *BOTH* "step-up" and "step-down" tap connections, from copper to ACSR, aluminum to ACSR, or aluminum to copper.

MASSIVE SPACER
Separates conductors . . . eliminates strand cutting . . . and aids in the prevention of galvanic corrosion between dissimilar conductors.



SECONDARY DEADENDING
Faster, easier. No threading through . . . form the loop, position Squeezon and compress! On insulated wire, strip only enough insulation to make the connection.

"SNAP-OPEN" BOX
Individually packaged. Box snaps apart along perforated line . . . INSTANTLY, CLEANLY . . . even with gloves! No stripping, no peeling.

NO DISTORTION
Squeezon groove jaws completely encircle conductor when compressed . . . provide dependable long-line, full circumference contact without distortion or damage to conductor.

for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
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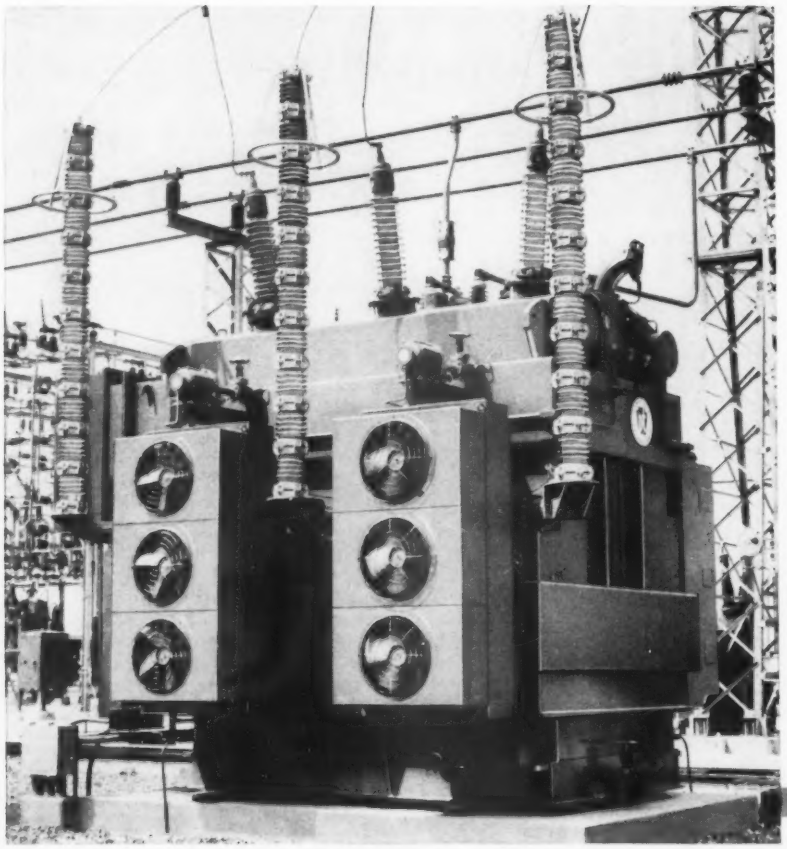
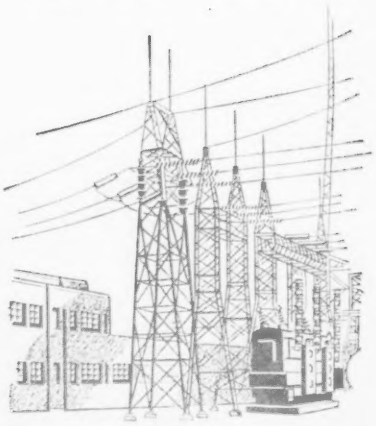


AT WOOD RIVER POWER STATION



At Wood River Power Station in Illinois, a 100,000-kva Pennsylvania LTC Transformer connects 138-kv and 34.5-kv buses to permit interchange of capacity between the two buses.

To Apportion the Load between Two Generators...

ILLINOIS POWER COMPANY CHOSE A 100,000 Kva LTC Transformer by PENNSYLVANIA

The total capacity of Illinois Power Company's Wood River Plant is 250,000 kw, of which 150,000 kw is connected to a 138-kv bus and 100,000 kw is connected to a 34.5-kv bus. By interconnecting these two buses with a 100,000-kva Pennsylvania LTC Power Transformer, Illinois Power is able to apportion the load between them to permit the greatest possible efficiency and economy of operation.

There are times (particularly during maintenance periods) when the load on the 34.5-kv bus is greater than the generating capacity at that voltage. When this occurs, part of the load is carried by the transformer, which in effect "transfers" it to the 138-kv bus. Conversely, there are other times (such as minimum load periods) when the load on the 34.5-kv bus is *less* than capacity and the transformer delivers this excess to the 138-kv bus.

The transformer—which features Pennsylvania's space-saving, weight-saving, shell-form Contour Design—has load tap changing equipment for plus or minus 10% regulation in 32 steps of 5/8%. The exceptionally quiet and efficient operation of this high-capacity LTC equipment is one of many reasons why leading utilities so often choose Pennsylvania. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

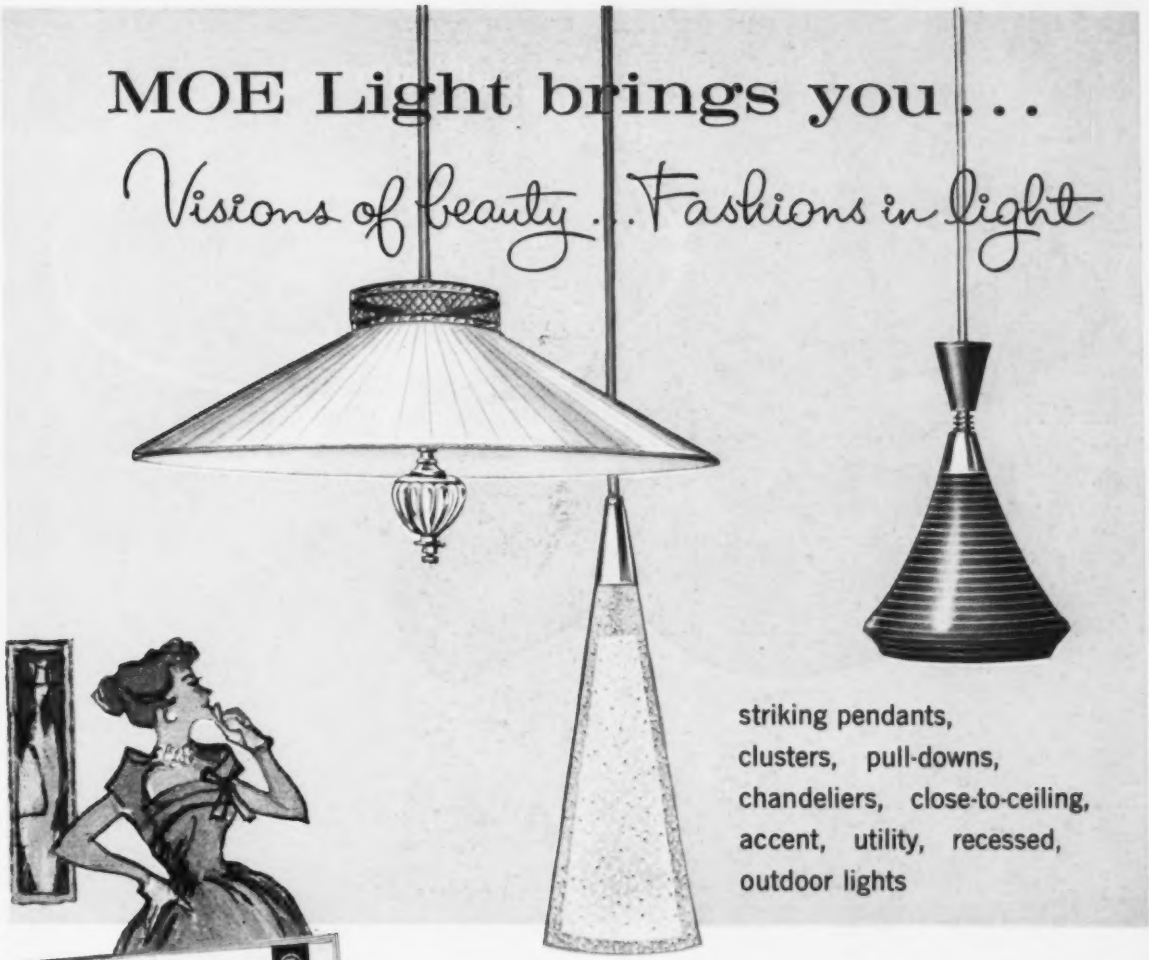
PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA POWER TRANSFORMERS

For phone number of closest representative see advertising index in back of book.

MOE Light brings you . . .

Visions of beauty . . . Fashions in light



striking pendants, clusters, pull-downs, chandeliers, close-to-ceiling, accent, utility, recessed, outdoor lights

a New Line of dramatic Decorator fixtures

. . . all shown in this incomparable new catalog and guide to decorative lighting

- 64 Pages in Full Color
- Hundreds of Decorator Fixtures
- Room-by-Room Lighting Guide
- Latest Decorative Lighting Ideas
- Easy Guide to Fixture Selection

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207 E. Broadway, Louisville 2, Kentucky
The World's Largest Single Source of Lighting for Home, Commerce and Industry

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Please send new free 64-page full color MOE Light Decorative Lighting Guide & Fixture Catalog.

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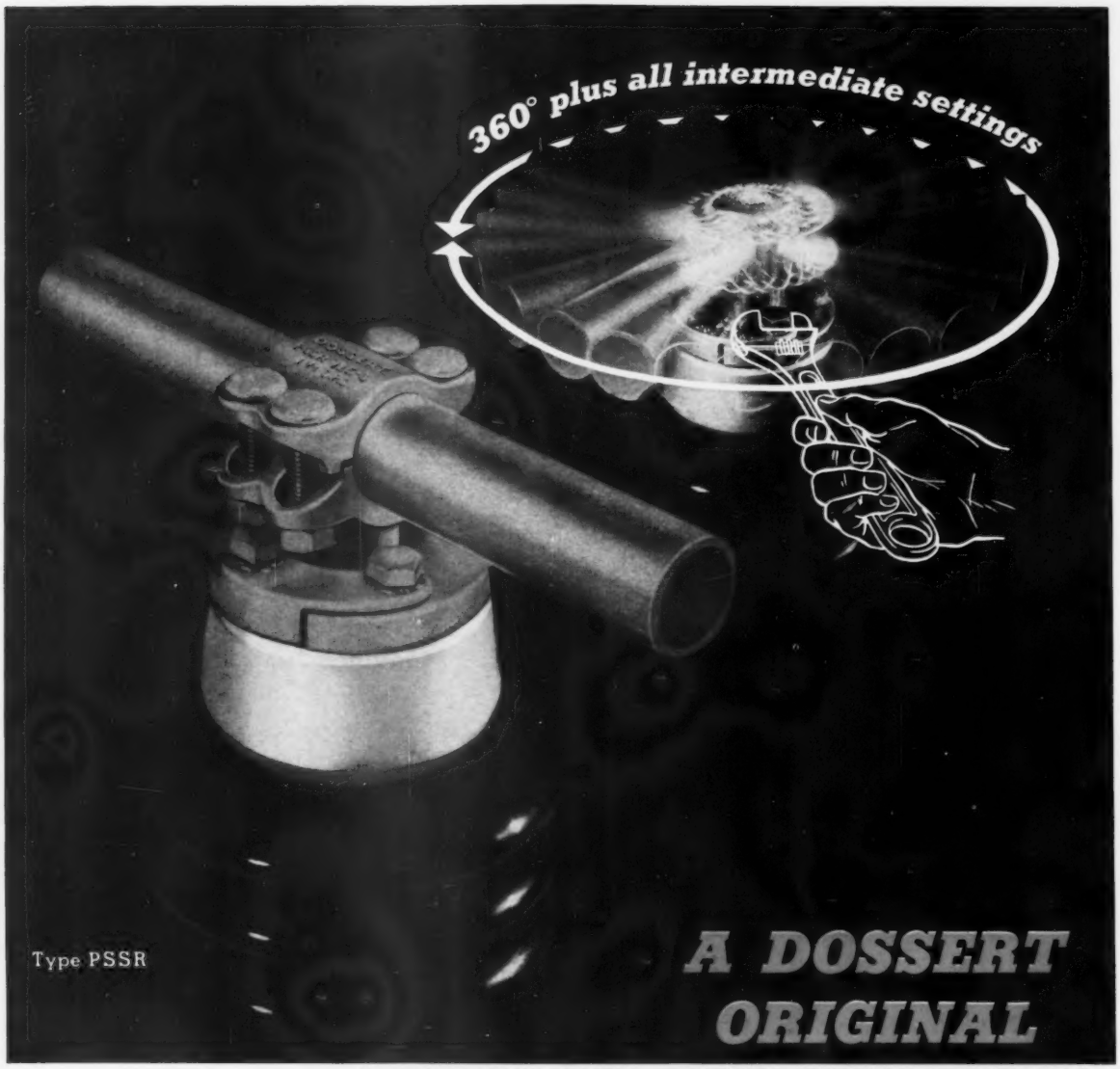

fully adjustable, TUBULAR BUS SUPPORT*

This bus support, made of high-strength bronze throughout, has the following outstanding features:

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

Write for illustrated brochure!

*U. S. PAT. 2,861,762

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DOSSERT MFG. CORP.

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Representatives in principal cities.

Distributed outside the U.S.A. and Canada by

INTERNATIONAL GENERAL ELECTRIC COMPANY

Construction Materials and Lighting Sales

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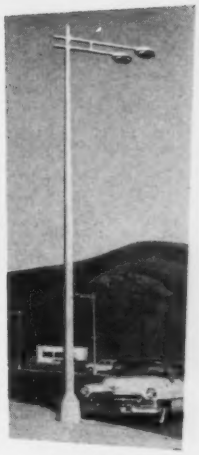
WELD-RITE standards

Grace Every Lighting Situation

Traffic signal



City street

Public park

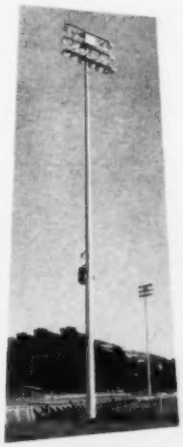
Freeway

Parking area

Supermarket lot

City street

Suburban street



Floodlighting

Write for 24-page catalog, showing complete Weld-Rite line, model numbers, specifications. No obligation.

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WELD-RITE COMPANY

Only active manufacturer of round tapered steel poles in the West

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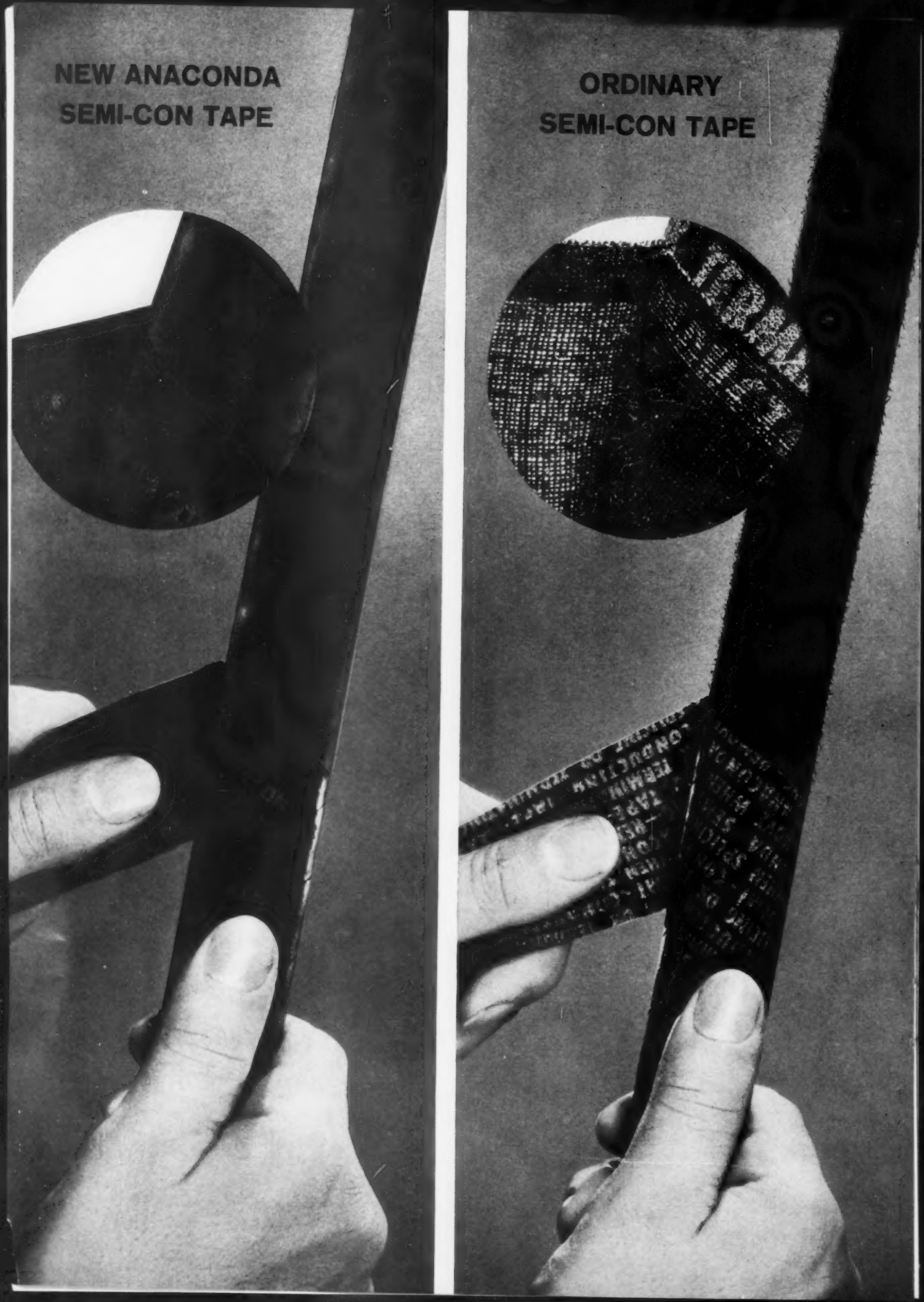

NEW ANACONDA
SEMI-CON TAPE
ORDINARY
SEMI-CON TAPE

NOW YOU CAN GET SAFER, FASTER, MORE RELIABLE JOINTS AND TERMINATIONS ON HIGH-VOLTAGE CABLE

Anaconda Durasheath has a new clean-stripping, semi-conducting tape

PROBLEM: To make a sound, safe, high-voltage splice, every last speck of semi-conducting tape material must be removed from the insulation . . . if traces remain, chances are the joint will eventually fail. But—this important step requires tedious scraping and buffing.

SOLUTION: The new Anaconda-developed *clean*-stripping, semi-con tape, which is an exclusive feature of Durasheath Cable. The photos (left) were taken immediately after semi-con tapes were stripped off the insulation. It takes much longer to get other cable insulation surfaces as clean. That's why this exclusive feature makes splicing a great deal easier.

The planned research and production program which brings you this outstanding cable development is also responsible for the equally important developments in Butyl rubber insulation compounding and extruding—which have produced the best possible balanced design and construction in high-voltage rubber-insulated cable obtainable today – Anaconda Durasheath.

For additional, more technical information about Anaconda Durasheath, write for Anaconda Bulletins, DM-5903, covering Durasheath High-Voltage Cable, and DM's-5566, -5720 and -5735, dealing with the splicing and terminating of Durasheath Cable. Contact your nearest Anaconda Wire & Cable Company district office, or write to 25 Broadway, New York 4, N. Y.

607239

ASK THE MAN FROM

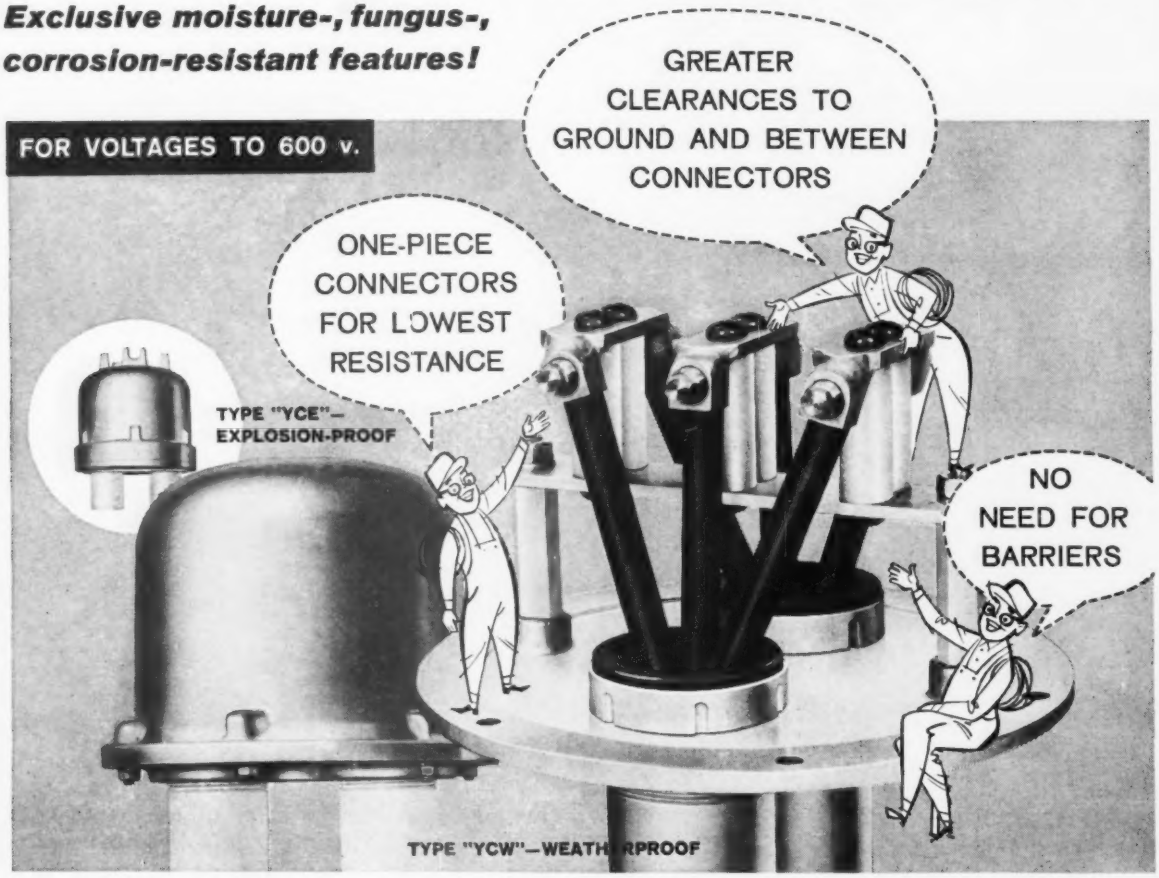
ANACONDA®

FOR DURASHEATH® CABLE

FASTEST WESTERN SERVICE—At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for every type of application. Anaconda assures the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

NEW! O.Z. PULL-N-SPLICE BOXES!
CONVENIENT·COMPACT·ECONOMICAL

Exclusive moisture-, fungus-, corrosion-resistant features!


FOR VOLTAGES TO 600 v.
GREATER CLEARANCES TO GROUND AND BETWEEN CONNECTORS
ONE-PIECE CONNECTORS FOR LOWEST RESISTANCE
TYPE "YCE"— EXPLOSION-PROOF
NO NEED FOR BARRIERS
TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

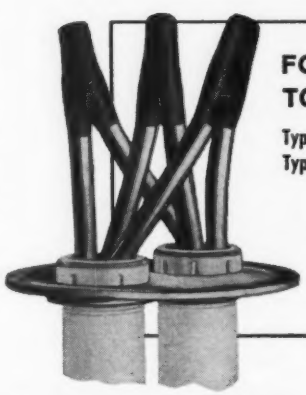
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



FOR VOLTAGES TO 5000 v.

Type "YPW" — Weatherproof
Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

O.Z. ELECTRICAL MANUFACTURING CO., INC.
262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
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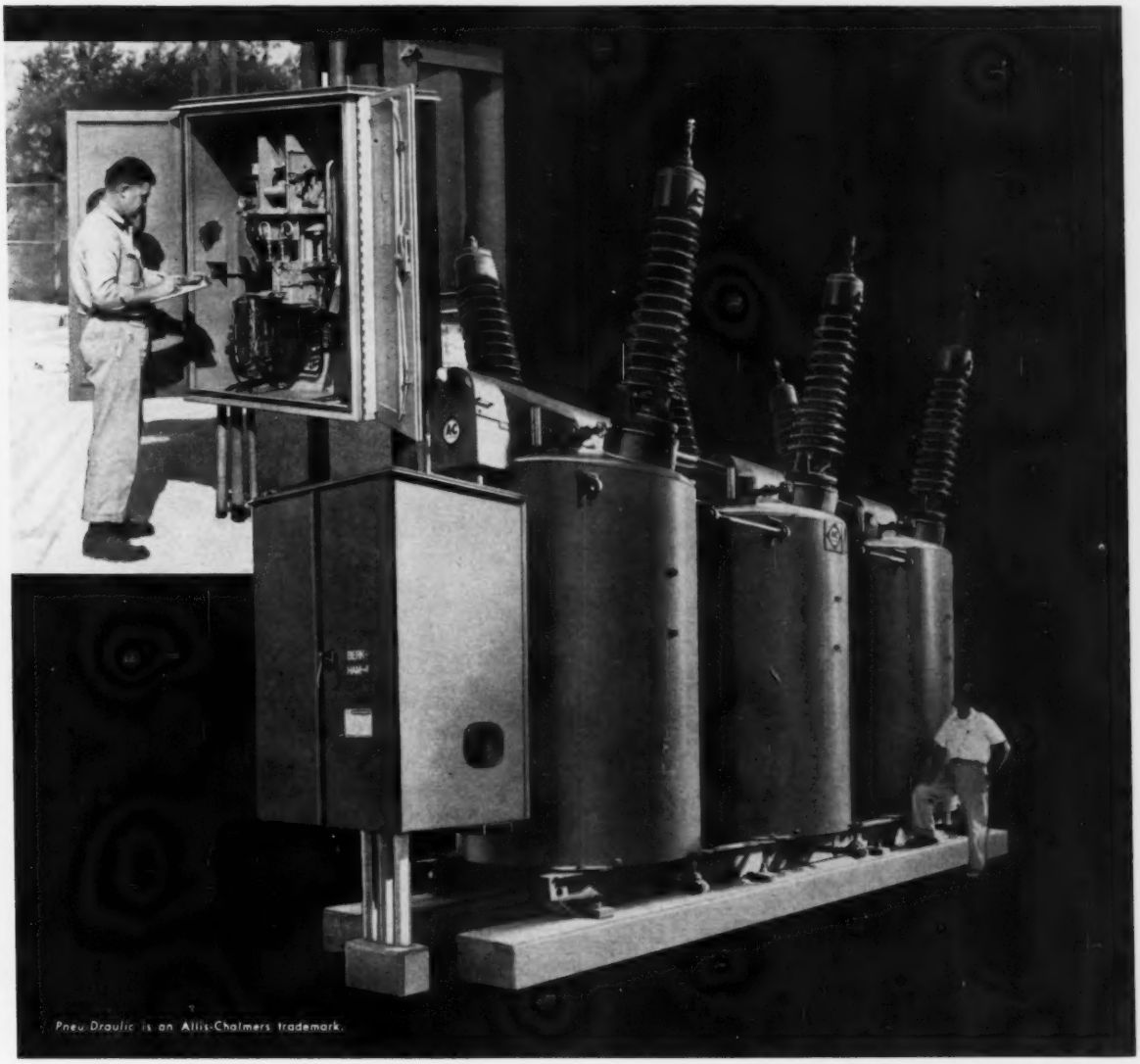
ALLIS-CHALMERS



This installation is repeated on 160 power systems.

It's well underway...the big swing to breakers with Pneu-Draulic operators

Here's how confidence adds up. An innovation scarcely six years old has won the acceptance of 160 companies — and over 60% have placed repeat orders. That's the dramatic record of the reliable *Pneu-Draulic* operator available on Allis-Chalmers outdoor breakers (14.4 to 345 kv, 500 to 25,000 mva).

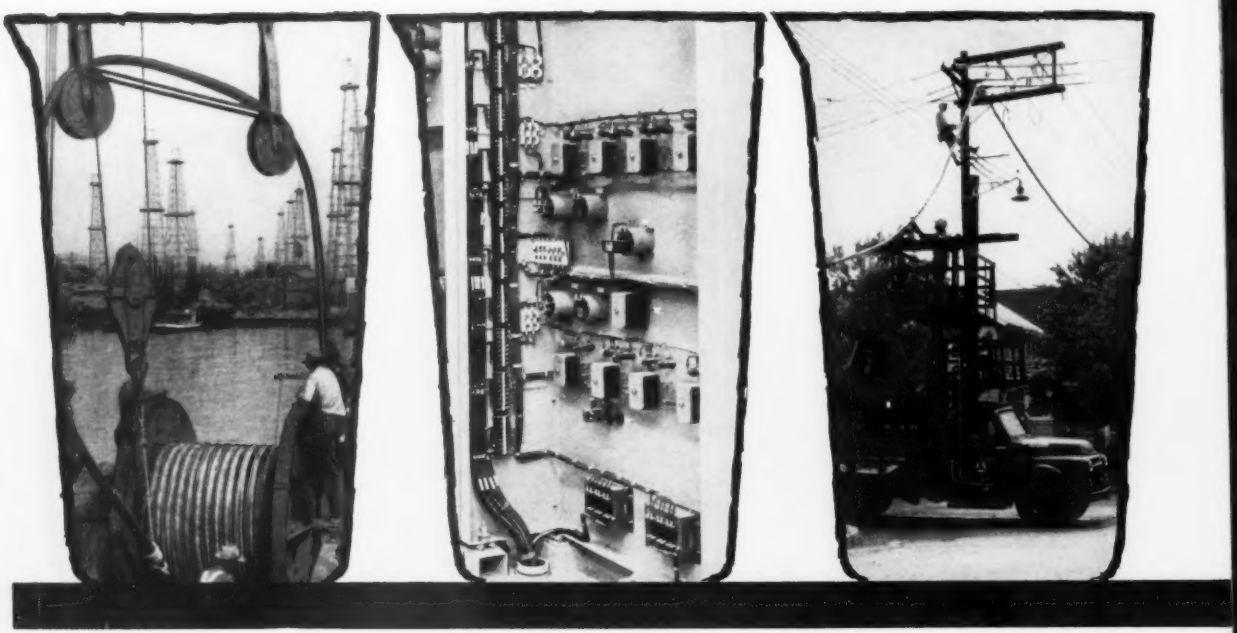
Reliable stored energy assures safe emergency closing of breaker at full rated speed onto energized line (even when no control power is available). Use of non-compressible oil instead of air ends use of trouble-causing anti-freeze solutions, eliminates moisture and corrosion problems. And, you get these additional benefits — mechanically trip-free operation, high-speed interruption.

Join the big swing to A-C breakers with low-maintenance *Pneu-Draulic* operators. Call your nearby A-C office or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin. A-1249

For phone number of closest representative see advertising index in back of book.

from the
laboratories of
General Cable...

PREMIUM QUALITY INSULATION COMPOUNDS



AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

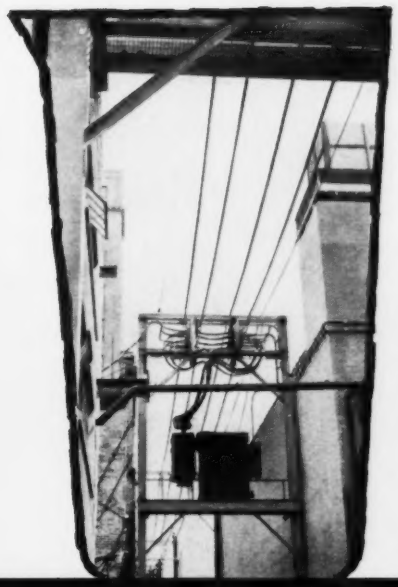
GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

In the modern General Cable laboratories, some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



THERMAX-W

and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

GENCASEAL (PVC)

in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

Offices and Distributing Centers Coast-to-Coast

GENERAL CABLE CORPORATION, 730 Third Avenue, New York 17, N. Y.

for quality and service specify... GENERAL CABLE

A cool, clean electric kitchen is included in the purchase price of every Medallion Home

This is Mrs. C. R. Campbell of Fullerton, California, in her all-electric Medallion kitchen

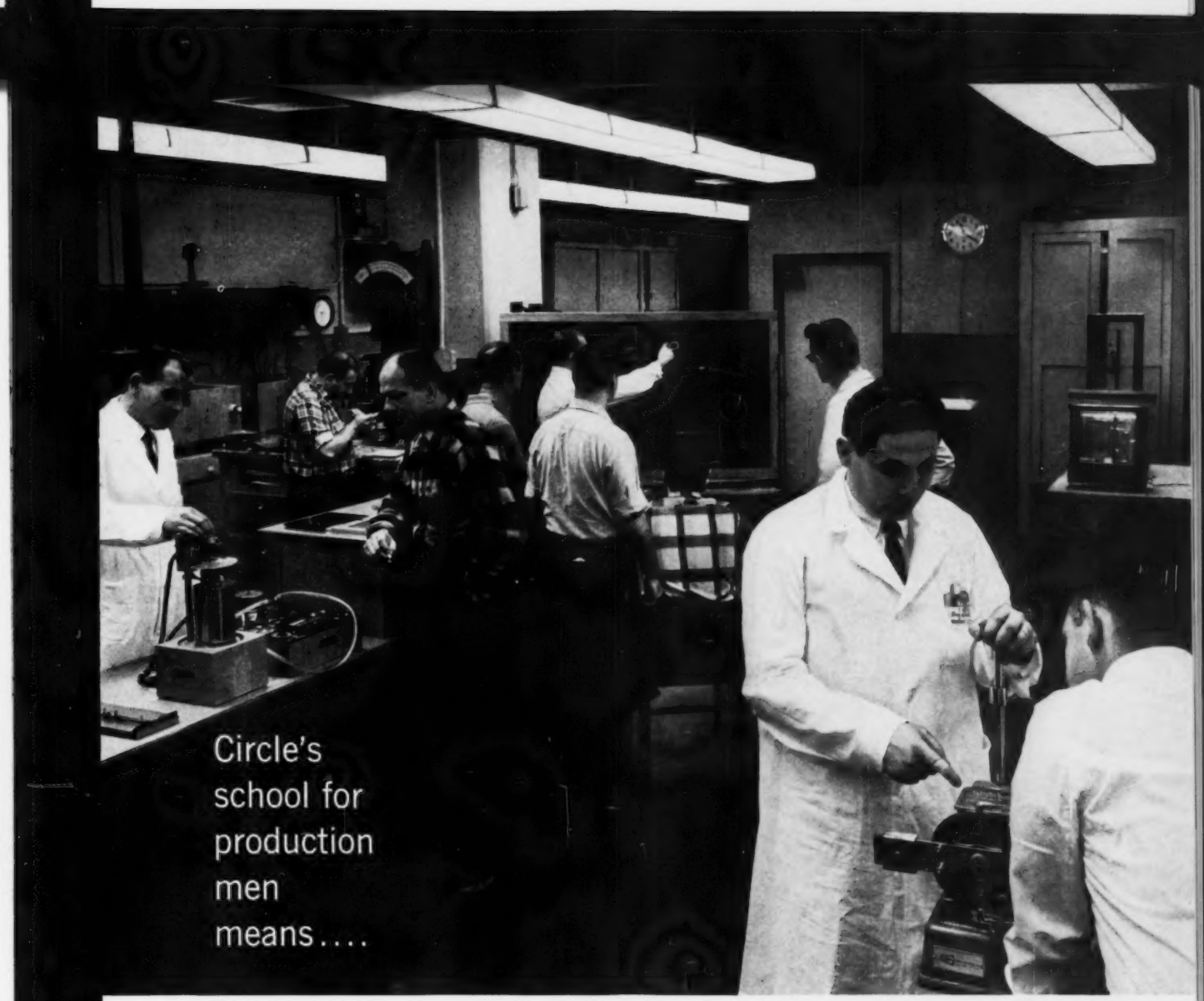
MEDALLION HOME
LIVE BETTER ELECTRICALLY

Help for wives: An all-electric kitchen is at your service the moment you move into your Medallion Home. The latest range-and-oven gives you a *clean* helping hand, important free minutes, a kitchen climate that's 16° cooler. And your Medallion Home affords the creative lighting you've always wanted — assuring you comfort, beauty, safety.

Savings for husbands: The appliances in the all-electric kitchen of your Medallion Home are already taken care of in the basic home cost. And your home is thoughtfully planned for full Housepower — wired for tomorrow's power needs as well as today's. Further, a Medallion Home is a *wise* investment. For, in a future that's all-electric, your Medallion Home will remain electrically modern.

Beyond all this is the Gold Medallion Home — the ultimate in living better with electricity. It's completely electric. And you have a wide choice of new electrical home-heating methods. One is the amazing electric heat pump... it *cools* your home without water, *heats* your home without flame.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY



BETTER WIRE AND CABLE FOR YOU

It isn't enough to build cable quality in the laboratory. There has to be follow-through in production.

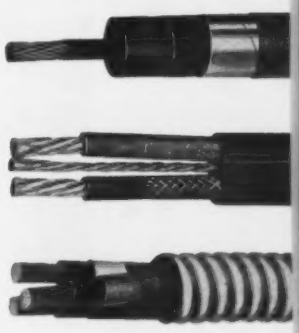
And that calls for production men who not only care enough but *know enough* to consistently turn out top quality products.

That's why Circle production men "go to school." Periodically they attend lectures given by skilled laboratory technicians. They review such subjects as extrusion techniques, proper operating speeds, production line testing procedures, etc.

In-plant training such as this is unusual for wire and cable men. It is one of many reasons, however, why Circle products have achieved a reputation for high quality.

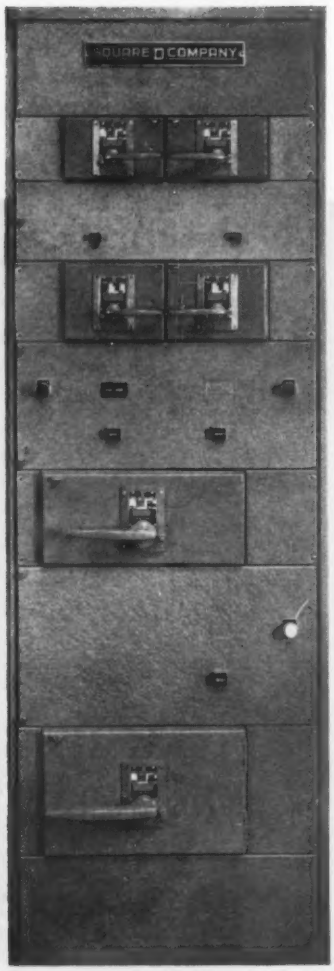
Next time you buy or specify cable, ask for Circle . . . there's no finer cable made.

*Trade Mark



CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE • PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE* EMT

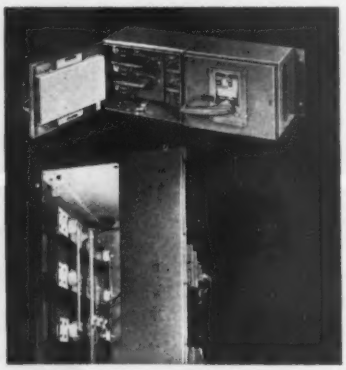


TYPE CS-2

fusible control switchboards now available from Square D!!

- New standardized depth of 20 inches.
- For compact grouping of combination motor starters.
- Also available with circuit-breaker disconnects.

CS-2 New QMB-fusible disconnect control switchboards.



Heavy-Duty "QUICK MAKE/QUICK BREAK" Fusible Disconnects—horsepower-rated, visible blades, range from 30 to 600 amperes, 250 to 600 volts.

BUS-STACK DESIGN—Square D's new horizontal bussing withstands higher short-circuit currents; makes installation easier by providing an unobstructed wiring area.

Write for complete details to: Square D Company, 4335 Valley Blvd., Los Angeles 32, Calif.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

"WHEREVER ELECTRICITY IS DISTRIBUTED AND CONTROLLED"

The "slave-hands" of an AI technician handle radioactive materials through a hot cell window 3½ feet thick. *Woodcut by Edward Kysar.*

Let A.I.'s experience guide your Nuclear Power Program

The largest privately-owned facility in the world for remote handling of radioactive materials is located at Atomics International's 290-acre field laboratory near Los Angeles. Here the men who pioneered the creative peacetime uses of atomic energy are applying their 14 years of experience to developing advanced nuclear reactors and associated equipment.

Much of AI's work has been on projects for the U.S. Atomic Energy Commission. This includes the Organic Moderated Reactor Experiment at the National Reactor Testing Station in Idaho and the Sodium Reactor Experiment in California. AI has also built and is operating SNAP II, a 220-pound prototype reactor designed to produce 3 KW of electricity for space vehicles.

With some of the most sophisticated facilities in the world at their disposal, the men at AI are now conducting studies for large power station reactors in the United States and Europe. Two reactors are now actually under construction under AEC programs—an Organic Moderated Reactor in Piqua, Ohio, and a Sodium Graphite Reactor in Hallam, Nebraska. Smaller research reactors have been built by Atomics International for Denmark, Germany, Italy, Japan, Puerto Rico and several sites in the U.S.A.

For details contact: ATOMICS INTERNATIONAL, Canoga Park, California, U.S.A. Cable address: ATOMICS.

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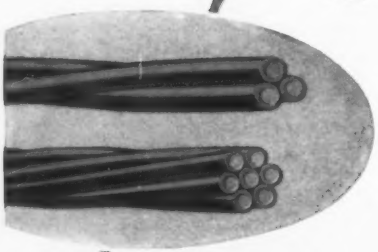

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ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 124, NO. 4 APRIL 1960

Canada's vast hydro resources loom importantly in the future as plans mature for . . .

POWER FROM THE PEACE

JACK D. STEVENS, CONSULTING ENGINEER, SEATTLE

W. C. Mainwaring, president of the Peace River Power Development Co., Vancouver, B. C.

The statement by W. C. Mainwaring early this year that the Peace River project is to go ahead in 1960, signaled the start of a tremendous new power project in British Columbia. Highlights of the project include:

1. A power development program costing over $600 million with the first-stage construction running to $375 million.

2. Installed capacity of the first two plants amounting to over 3,000,000 kw. First stage of 805,000 kw in 1968.

3. A 550-mile, 500-kv transmission line from the dam site to the lower mainland. Easily the highest voltage on the continent.

4. Formation of a storage reservoir 200 miles long impounding 88 million acre-ft of water; nine times the total amount of storage at Grand Coulee.

5. A market for Peace River power will be readily available in Canada and the United States.

The main storage dam at Portage Mountain will create a large reservoir in the northern part of the Rocky Mountain Trench. The fantastic Trench extends all the way from the Yukon border south into Montana.

The Parsnip River flows northwest along the Trench and the Finlay flows southeast to Finlay Forks where the two join to form the

Peace River. The Peace flows east into the Province of Alberta and then north, ultimately joining the MacKenzie before the latter empties into the Arctic Ocean. This route to the Arctic accounts for the freedom of the Peace from salmon fishery problems. Also, because of the remoteness of the area, the Peace River project will be free from the usual conflicts with highways, railroads, towns and other symbols of civilization.

The origin of the Trench is a geological upheaval. The route of the Peace predates the Canadian Rockies, which have risen only to be carved and worn away by the persistent waters of the Peace. This is the only river that crosses the Rocky Mountains from west to east. Between the settlement of Finlay Forks and the city of Fort St. John, a sharp "U" in the river tells of a geologically recent glacier which dumped a giant ridge of moraine across the river causing it to change its course.

Crossing the Peace at one of the upper ends of the U will be the Portage Mountain Dam, a structure 600 ft high and 7,000 ft long at the crest. Installed capacity of the power plant will be 2,500,000 kw. A smaller dam, Site No. 1, will be constructed downstream near the village of Hudson Hope. Its associated power plant will have an installed capacity of 650,000 kw. Additional developments downstream will increase the total installed capacity to about 4 million kw in British Columbia. There is also a potential of about 4 million kw on this river system in Alberta.

Serious attention to the Trench came during the early years of World War II when it was surveyed as a possible route for the Alcan highway. On an occasion in 1956, W. A. McAdam, then British Columbia's Agent-General in London, showed some wartime slides of the area to Bernard Gore, an associate of Dr. Axel Wenner-Gren. Gore immediately sensed the great potentials of the area and after a preliminary investigation, the Wenner-Gren B. C. Development Co. Ltd. entered into an agreement with the provincial government. The initial interest was in a railroad to the Yukon from a point where the Pacific Great Eastern Railway crosses the Trench. Also in the agreement were rights to survey the forest, water and mineral resources and make applications for future developments. While some have accused the provincial government of giving away resources, actually the agreement only limits the people's rights to stake speculative claims in the area while major engineering feasibility studies are going forward.

Site No. 1, a secondary dam, lies about four miles west of Hudson Hope and may be a concrete or rock-fill structure with power house close to the dam

This development, called Portage Mountain Dam, is in a portion of Peace River Canyon with a 600-ft width. A rock- and earth-fill dam with power house close by is planned

By the fall of 1958 it appeared that a large hydroelectric development was feasible and the Peace River Power Development Co. Ltd. came into being to formulate specific plans. At the end of 1959 plans went to the Department of Lands and Forests for approval. Later they will go to the Public Utility Commission for a Certificate of Necessity and Convenience. In a similar manner, proposals will be submitted for the establishment of forest products and mining industries, and for the construction of a railroad north from Prince George to the Yukon border. All proposals must be submitted with firm plans or their reserves will no longer apply. With a market, a resource and a comprehensive plan, there seems little question that the project will move rapidly forward.

Present studies show that there will be no conflict for markets between Peace River and the Mica Creek project to be constructed on the upper Columbia River. Both projects will be needed in the Pacific Northwest load as rapidly as they can be brought into operation. Neither will there be any unusual operating problems. They can be operated effectively together for loads in British Columbia or in coordination with power systems in British Columbia and the Northwest Power Pool.

Although the present concept is for the Peace River project to operate only in coordination with the

utilities of British Columbia, it is of such magnitude that it could favorably influence a coordinated operation of all Pacific Northwest utilities on both sides of the International Boundary. An international power pool of this nature would operate along the same lines as the present Northwest Power Pool but the operation would be more exact and of much greater magnitude. The tremendous amount of storage at Portage Mountain would strengthen the firm power structure of all participating utilities.

Pool Membership

The Northwest Power Pool consists of the major operating utilities in Oregon, Washington, Idaho, Montana, Utah and southwestern British Columbia. The 11-member utilities consist of Puget Sound Power & Light Co., Portland General Electric Co., Pacific Power & Light Co., Washington Water Power Co., Seattle City Light, Tacoma City Light, Bonneville Power Administration, Idaho Power Co., Utah Power & Light Co., Montana Power Co. and the British Columbia Electric Co. Although the pool membership is presently limited to the 11 major Northwest utilities, all are interconnected with the smaller electric utilities in the adjacent service areas.

On a pooling basis, all plants and storage reservoirs are operated in concert and operations at one plant have a direct influence on the operations at others. For example, the operations at Bonneville are coordinated with the operations at Hungry Horse, although 1,200 river miles separate the two projects. Energy is delivered east to the Montana-Utah-Idaho utilities in the summer months and west to the Pacific Coast utilities in the winter.

Surplus power and energy are interchanged so as to obtain the fullest utilization of resources at the least possible cost. Surplus peaking on one system is combined with surplus energy on another to provide a salable commodity. Nighttime and week-end energy which cannot be fitted into one utility's load is placed in storage in another utility's reservoir for later use. This is accomplished by using the surplus to pick up load on the storage plant. When generation is backed off at the storage plant, a credit is built up in the reservoir. This energy is generated out when it can be used. The Peace River project will fit beautifully into this type of operation.

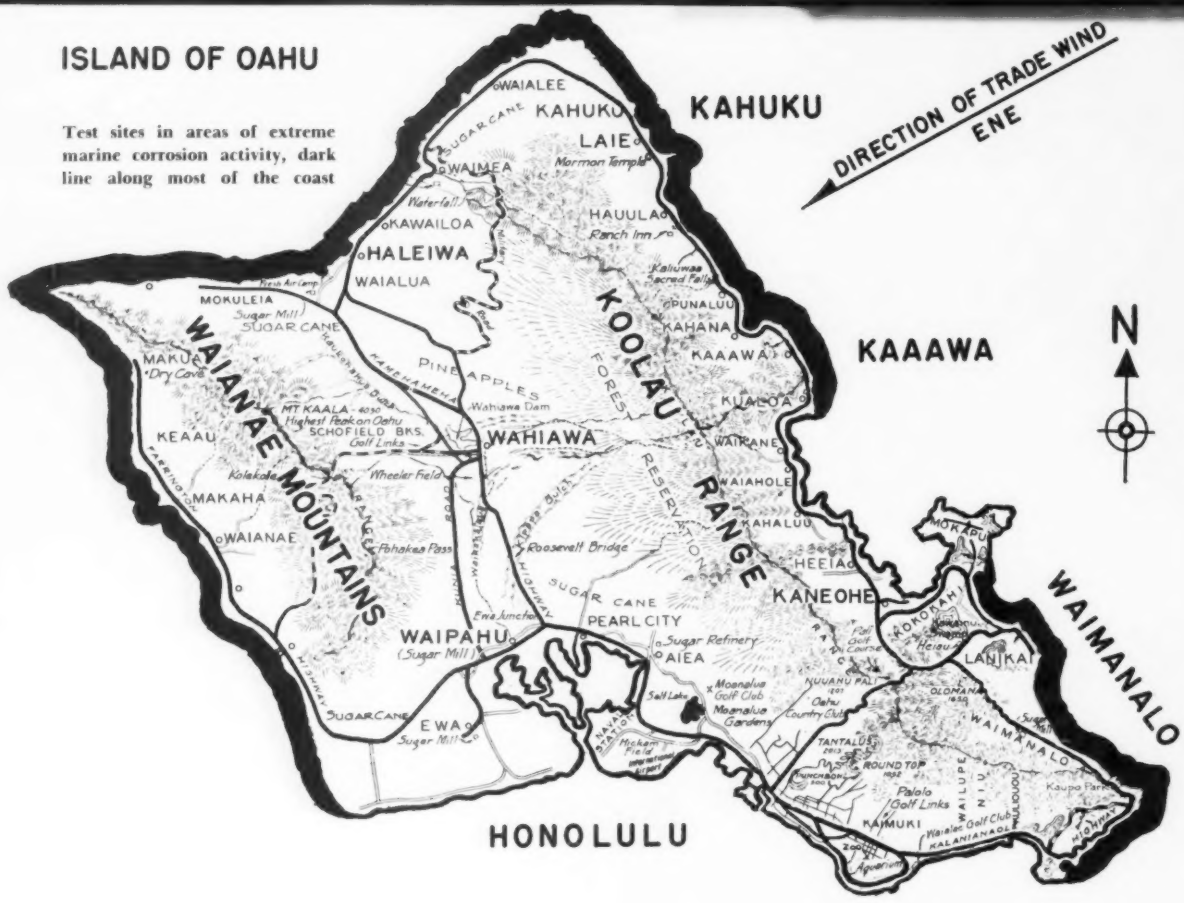
Of the 88 million acre-ft of storage planned for the Peace River reservoir, about one-half will be usable for power production purposes. The ability to take surplus energy into storage and hold such storage for several years if necessary, will be of tremendous value to Northwest utilities. Billions of kilowatt-hours are wasted each year when the annual reservoirs fill and unused energy is spilled down the rivers. In the future, much of this energy will be conserved until needed by placing it in the Peace River reservoir. The procedure will be the same as that now in use but with this major difference. All Northwest reservoirs except Hungry Horse operate on an annual cycle and energy that is not drafted by early spring is wasted when the reservoirs fill from flood flows during the summer months. The Peace River reservoir will provide complete control of the river and no energy will be spilled as a result of limited storage space or changes in streamflow conditions. It will be possible to hold storage in the Peace River reservoir for several years without danger of spilling. A great deal of Columbia River energy can be generated each year from high streamflows and placed in storage at Peace River. All such surplus will be returned as firm energy when usable in the load.

The Peace River project also can be operated to store large amounts of secondary energy needed to firm up the Mica Creek project proposed for construction on the Upper Columbia River. Surplus energy stored in the Peace River reservoir can be generated for British Columbia loads during summer months when generation must be reduced at Mica Creek in order to fill the reservoir.

In addition to the normal interchange and storage of energy, there can be important deliveries of firm energy to the United States from British Columbia. This will most properly result in the creation of a Pacific International Power Pool, which will coordinate the operations of the major utilities in British Columbia with the operations of the Northwest Power Pool.

The multitude of benefits of large-scale pooling operations have long been recognized, particularly in the Pacific Northwest. The Peace River project will, in a few words, provide vast amounts of firm energy; conserve regional resources; and reduce regional power costs by making possible a more effective use of the region's resources. The Pacific Northwest is indeed fortunate in having, in its midst, one of the world's great power projects.

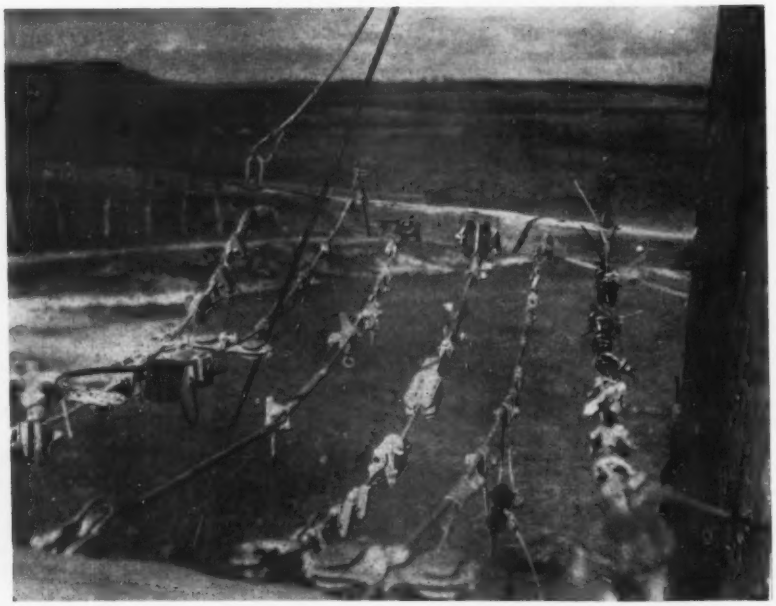
In a westerly direction downstream from Site No. 1 (out of range in top left hand corner), lies the Canadian village named Hudson Hope



Faced with serious corrosion problems, Hawaiian Electric engineers use worst conditions to . . .

TEST DISTRIBUTION COMPONENTS

M. K. DEAN, ELECTRICAL ENGINEER, HAWAIIAN ELECTRIC CO. LTD.

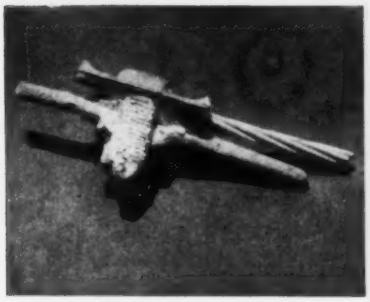


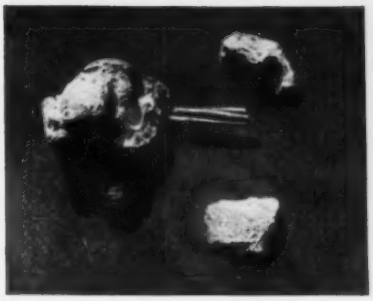
The Pacific tradewind, which has glorified the Hawaiian palm tree and grass skirt, also causes operating problems for Hawaiian utilities. Surrounded by the Pacific Ocean, these winds, averaging 12 mph, with average peak gusts of 36 mph, create many areas of severe marine contamination. In such areas replacement of hardware connectors and transformers is a costly occurrence.

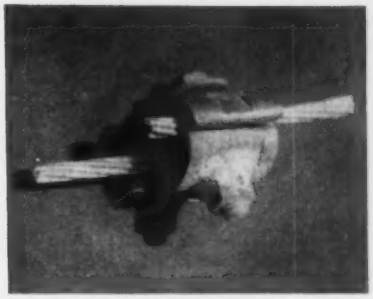
This condition creates factors that Hawaiian Electric Co. personnel must evaluate in selecting hardware, conductors, connectors, transformers and equipment components for applications in areas where salt water corrosion is excessive.

On the Island of Oahu the zone of accelerated contamination covers an area a half-mile inland for approximately three-quarters of the island shoreline.

Connector rack tests 103 devices exposed







Dissimilar metals in any combination (left), even when plated (center), decomposed rapidly. In sharp contrast, the all-aluminum hardware (right), shows little deterioration after exposure to the same conditions. This arrangement has proved best to date

The conditions encountered in this area are not unlike conditions encountered in coastal areas along the California, Oregon and Washington coast.

In an effort to evaluate the corrosion resistance of pole line hardware transformer cases and connectors, three test sites were established at Kahuku, Kaawa and Waimanlo (see map) on the windward side of the island.

Connector Test Program

The majority of the connectors were located at the Kahuku site on the northeastern tip of the island where the connectors were installed as if a normal electrical connection were being made. The conductors were wire brushed and a grease inhibitor used in the grooves of each connector whenever aluminum-to-copper or aluminum-to-aluminum connections were made. The connectors at the Kahuku site were not energized, but similar connectors at the Kaawa site and Waimanalo site were energized.

A study of the many types of connectors tested indicate:

- Energized connectors behaved the same as unenergized connectors in areas of marine corrosion.

- Plated bronze, copper or a combination of aluminum alloy and bronze or copper split bolt connectors caused failure to the aluminum conductors in a matter of a few months. The plating failed to protect the aluminum conductor from coming into contact with the bronze or copper base metal.

- Plated aluminum body parallel groove connectors proved detrimental to the aluminum conductor and the connector, causing the conductor to fail. Apparently there is enough spread in the galvanic series between most platings and the aluminum conductor to cause galvanic action in the presence of salt moisture.

- Aluminum body connectors, regardless of the alloy and type of connector, fail when combined with dissimilar metals such as galvanized nuts, bolts and lock washers.

- Aluminum body hot line connectors with a bronze tap connector and a bronze main line clamping terminal froze because of corrosion products building up in the protected barrel of the clamp between the aluminum body and the bronze mainline clamping terminal.

- Connectors, which were greased to determine whether greasing would prolong life, showed signs of corrosion after a year. It appears, then, that while greasing prolongs life, it does not add enough life to make the cost of greasing worth-while.

These results lead to the conclusion that the only connector that will be satisfactory for aluminum-to-aluminum connections in a marine exposure is one made entirely of the proper aluminum alloy body and compatible aluminum clamping hardware. In addition, aluminum compression-type connectors, even those that are used for aluminum-to-copper connections, appear to be in excellent condition after many months of service.

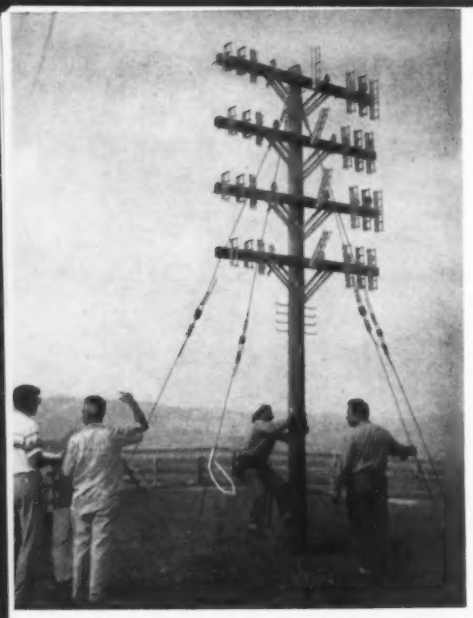
Hot-line connectors with dissimilar metals also spell trouble. The products of corrosion occupy a greater volume than the base metal, causing cracking

Hardware Test Program

A hardware evaluation program was initiated in cooperation with Kaiser Aluminum & Chemical Corp. to compare the corrosion performance of aluminum with aluminized and galvanized steel hardware. In addition, two separate aluminizing processes were compared and two separate steels were used to determine whether the base material influenced the performance of the zinc and aluminum coatings. The hardware items were installed on four separate crossarms, staggered slightly to prevent drippage of moisture or corrosion products onto the pieces mounted on the lower crossarms. The four crossarms carried identical sets of hardware to allow for exposure periods of one, three, five and ten years. The following results cover the conclusions reached after examining the one- and three-year crossarms. It is believed that continued exposure will only reinforce these findings.

Aluminum hardware was demonstrated once again to be the most serviceable — confirming previous experience with aluminum in marine environments. The aluminum surfaces were unaffected by contact with the creosoted pole or the pentachlorophenol-treated crossarm.

Aluminized steel proved to be the second best material. In general, the corrosion appearance of aluminized steel at the end of the three-year test period was superior



The hardware test rack has a series of identical crossarms, which are inspected at intervals to compare performances

to that of galvanized steel at the end of a one-year period. The two aluminizing processes showed little difference other than that which might result from slight differences in thickness of the aluminum coat. The base material made little difference in corrosion resistance.

Galvanized steel, whose poor performance was the cause for the study, was badly corroded at the end of the three-year period. There was some indication that the use of low-alloy steel base metal made for an improved product, but this might have been the result of slightly heavier zinc coating.

Transformer Test

It has been Hawaiian Electric's experience that standard painted steel transformer cases will require maintenance after approximately three years of marine exposure. This being a costly problem, a test was started of various types of transformer cases to find out which would stand the marine exposure.

Various locations along the windward coast were selected to test these different types of transformer cases and cases covered with different types of protective materials.

Now under test are one all-aluminum tank transformer, two porcelain tank transformers, two plastic-coated steel tank transformers and one transformer with a marine resistant finish.

No definite conclusions can be made at this time as the transformers have not been exposed long enough; however, the aluminum tank transformer seems to be in the best condition after 2½ years' exposure.

LOADING GUIDE INCREASES

E. G. PETERS, WASHINGTON WATER POWER CO.
H. C. BREM, REGULATOR DEPARTMENT, ALLIS-CHALMERS MFG. CO.

Overload capabilities of electrical equipment have always been of vital interest to utilities. Washington Water Power Co. of Spokane, Wash., is particularly interested in regulator loading, since it has many regulators in use. Experience of the Washington Water Power Co. has shown that regulators can be operated at higher than rated kva because daily load factors of feeders and ambient air temperatures dovetail. By using the available ASA Appendix C57.95, "Guide for Loading Oil Immersed Step Voltage Regulators" (November 1955), and applying their own operating experience, the company engineers worked out their own practical guide for regulator loading. This article presents this and various other procedures that could be followed to determine such guide data.

ASA Appendix C57.95 notes the many factors to be considered in the overloading of regulators (see box) and emphasizes the limitation of the oil expansion pressure in sealed-type units, bushing capability, leads, soldered connections, thermal ratings of windings, tap changers and control equipment including current transformers and line drop compensators. In addition to the limitations in the components of the regulators, the thermal capabilities of associated equipment such as cables, reactors, circuit breakers, disconnect switches, power transformers, current transformers and other operating apparatus must also be considered. The overloading of regulators at frequent intervals requires that inspection be made more frequently, especially if such overloading exceeds 150%.

The initial loading of a regulator has a direct bearing on regulator insulation life. Initial load is that loading condition which is continued long enough for the regulator to arrive at a constant temperature. For over-all operation, following an initial load of 90%, a regulator will have a normal life expectancy if it is operated for half-hour periods at no greater than 1.59 times its rated kva. It can also be operated as much as eight hours with an overload of 106%. In Fig. 2 are shown illustrations following initial loads of 90, 70 and 50%. Note that, as the initial loading decreases, it is possible to increase the daily overload. It is also to be noted, as indicated by the asterisk, the original design limitations must be considered when loading in excess of 1.5 times rated kva. Normal life expectancy is achieved under all of the described conditions.

It is normal to expect loads of greater size and longer duration than the limiting values previously given. Under such conditions, there

FIG. 2—OVERLOADS FOR NORMAL LIFE EXPECTANCY

Self-Cooled Regulators
Times Rated Kilovolt Amp

Time (Hours)	Initial Load (Per cent)		
	90	70	50
½	1.59	1.77*	1.89*
1	1.40	1.54*	1.60*
2	1.24	1.33	1.37
4	1.12	1.17	1.19
8	1.06	1.08	1.08

Shows the overload that can be imposed for various times with normal life expectancy of insulation as a function of initial loading.

FIG. 3—50% INITIAL LOAD FOR SHORT TIME LOADS

Moderate Sacrifice
Of Insulation Life Expectancy

Time (Hours)	Times Rated Kva	
	0.1% Loss	1.0% Loss
½	2.00*	2.00*
1	1.76*	2.00*
2	1.50	1.82*
4	1.27	1.53*
8	1.13	1.37
24	1.05	1.23

Shows the short-time overloading with moderate loss of life when the regulator has been brought to normal operating temperature by imposing a 50% initial load.

*Indicates that loading above 150% requires more frequent periodic inspection.

REGULATOR LIFE

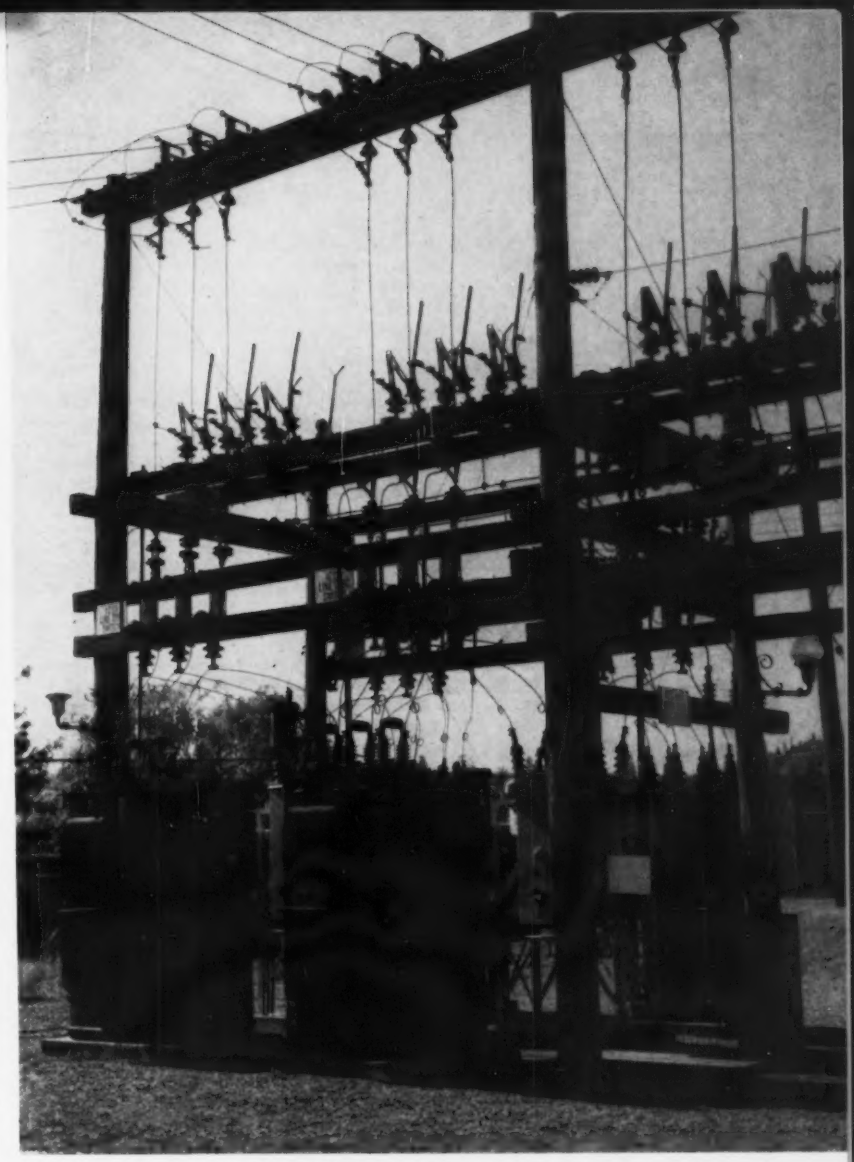


Fig. 1—These two Allis-Chalmers 300-kva, 13,800-v, 126-amp, three-phase regulators with ∓10% regulation in 32 ⅝% steps control three feeders from this Washington Water Power Co. station. Each feeder is normally rated at 200 amp (approximately 4,500 kva) and the station is one of the 110/13-kv units in the company's 13-kv subtransmission system

will be some loss of normal insulation life. Our first analysis shown in Fig. 3 covers 50% initial load for short time loading. This results in a moderate sacrifice of insulation life, and as the loading is increased there is greater loss of insulation life. The absolute maximum load is 200%. Loading time must also decrease as the load is increased to prevent excessive loss of insulation life. In our guide, Fig. 4, for 100% initial load, insulation life loss becomes greater. For a half-hour period of loading, life loss is 0.10% for loading of 1.75 times rated kva, and is 1.00% on the maximum allowable loading of 2.0 times rated kva. Considering one-hour periods, the life losses are 0.10% at 1.54 times the rated kva, and 1.0% when operated at 1.92 times rated kva. However, for longer periods of time such as 24 hours, the loading and life loss are the same as that following 50% initial load for the same period of time (Fig. 3).

For the purpose of loading feeder regulators to the best advantage, Washington Water Power Co. has made good use of ASA guides, particularly the one based on daily load factor and ambient air temperature. This company is fortunate in that peak loads occur in the wintertime coincident with minimum ambient temperatures and seasonal minimum daily load factor. This combination of conditions allows a feeder regulator to be greatly overloaded at the time of seasonal winter peak and still have ample capability reserve for other times of the year, all without appreciable loss of normal insulation life for the regulator.

In order to have a clearly understandable, readily available and easily applicable method or guide for loading regulators under local conditions of ambient air temperature and load factor, this company derived a loading curve for application to 10% range regulators on typical residential feeders. This curve is shown in Fig. 9. Also incorporated is a table showing multipliers to be applied to the loading values obtained from the curve for regulators with a reduced range of regulation including Vari-Amp. To do this, representative residential feeders were investigated for peak load and seasonal load factors. Also, weather conditions for a period of 54 years were analyzed. These data were then used in accordance with ASA guides for loading by ambient air temperature and by load factor.

To determine feeder daily load factor, feeder load data for both hourly average amperes and mwh were plotted on semi-log paper to provide for easy curve comparison and to show possible effect of power factor. These curves, as shown in Figs. 5 and 6, were plotted for both the maximum and minimum sea-

FIG. 4 — 100% INITIAL LOAD FOR SHORT TIME LOADS

Moderate Sacrifice Of Insulation Life Expectancy

Time (Hours)	Times Rated Kva	
	0.1% Loss	1.0% Loss
½	1.75*	2.00*
1	1.54*	1.92*
2	1.35	1.68*
4	1.20	1.48
8	1.11	1.35
24	1.05	1.23

Shows the short-time loading that can be imposed when the initial loading is 100%. Once again, there is a small sacrifice of insulation life from overloading.

SUMMARY OF ASA LOADING GUIDES

HOTTEST SPOT TEMPERATURE—As long as the hottest spot temperature is not greater than 95 C at any time, the regulator may be loaded above its normal rating for any length of time without loss of insulation life expectancy. This 95 C temperature limitation is based on a total of 30 C average ambient, 55 C average copper rise and 10 C hottest spot copper rise for units with sealed tank, conservator, gas oil seal or inert gas pressure systems.

TOP OIL TEMPERATURE—As long as the top oil temperature does not exceed 35 C, the regulator can be operated at 1.99 times its rated kva. As the temperature of the top oil increases, the loading of the regulator must be decreased to prevent any loss of normal insulation life. However, because of large variations in the difference between the hottest spot copper and top oil temperatures under full load, oil temperature alone should not be used as a criterion. The guide also indicates that all of the design limitations as given previously must be considered when the regulator is operated above 1.5 times its rated kva. See asterisks in Fig. 2. For example, if the top oil should rise as high as 75 C (167 F), the regulator should not be operated in excess of its normal rated kva if normal life expectancy of the insulation is desired.

MAXIMUM WINDING TEST TEMPERATURE RISE—For each degree centigrade difference (less 2 C) that the test temperature is below the standard temperature specified, the regulator load may be increased 1% above the rated kva of the regulator (Fig. 7). Under these conditions, insulation life expectancy will be normal. The 2 C allows for a small negative tolerance in the temperature measurement.

AVERAGE AMBIENT AIR TEMPERATURE—When the average ambient temperature is above or below 30 C (86 F), the regulator loading must be *decreased* by 1.5% of its rated kva for each 1 C increase in the average ambient air temperature above 30 C to maintain normal insulation life expectancy. However, if the average ambient air temperature is below 30 C, the regulator load can be increased above its rated load kva by a 1.0% for each 1 C difference. Average temperatures should be for periods of time not exceeding 24 hours, and the maximum temperature should not be more than 10 C greater than the average temperatures for air.

DAILY LOAD FACTOR—If the daily load factor is below 100% the regulator loading may be increased above its rated kva by 0.5% for each per cent that the daily load factor is below 100%. However, the maximum increase may not exceed 25%. For example, with an 80% daily load factor, the maximum to which the regulator can be loaded would be 110% of rated kva.

sonal loadings, which occurred in January and July, respectively. To obtain representative curves, on a daily basis, the hourly readings for the January high week and the July low week were averaged and plotted. The reason for using hourly values average for the seven days of a week was to apply smoothing to the daily curve. The areas under the curves were next mathematically integrated by the method of ordinates and averages per hour obtained. By dividing the maximum hourly average peak into these values, the load factors were obtained for the summer and winter extreme weeks. These load factors were approximately 72 and 65%. It is to be noted that daily load factors will generally be somewhat higher than load factors for longer periods.

After obtaining load factor values, it is only necessary to know ambients to determine load capability. Fig. 7 shows capability curves for an average year using load factor values of 50, 75 and 100% and average maximum air ambients for Spokane.

It would be desirable to have a regulator loaded to its maximum capability at all times of the year; however, to realize this, the load curve for the regulator would have to coincide with the capability curve. This possibility has very little chance of occurring on the Washington Water Power Co. system and means that if a regulator is loaded to its full capability at the time of annual feeder peak it will be underloaded at other times of the year. To determine the annual load shape of the representative feeder, weekly mwh

Fig. 5

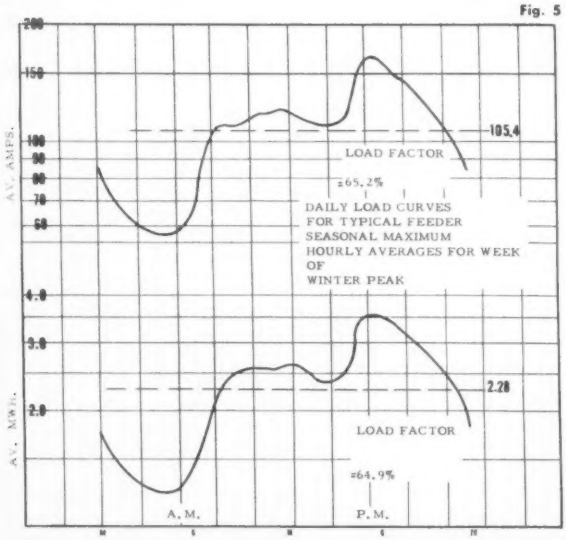


Fig. 6

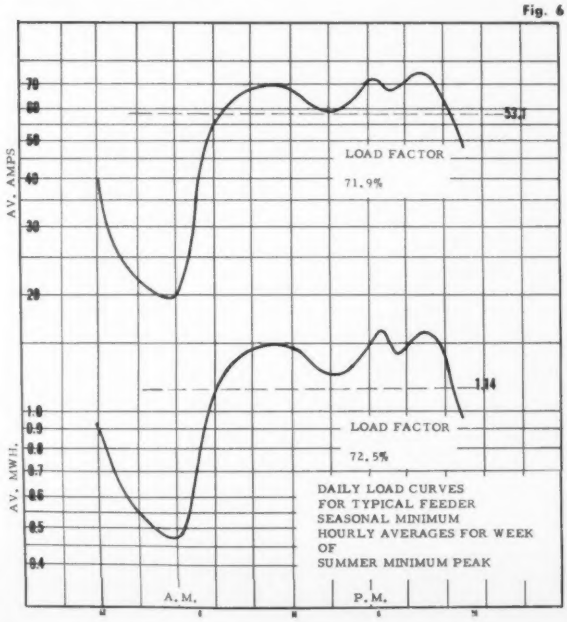


Fig. 5—Daily load curve for a typical feeder on the WWP system during the winter peak. Fig. 6—Daily load curves for a feeder showing hourly averages for week of summer minimum peak

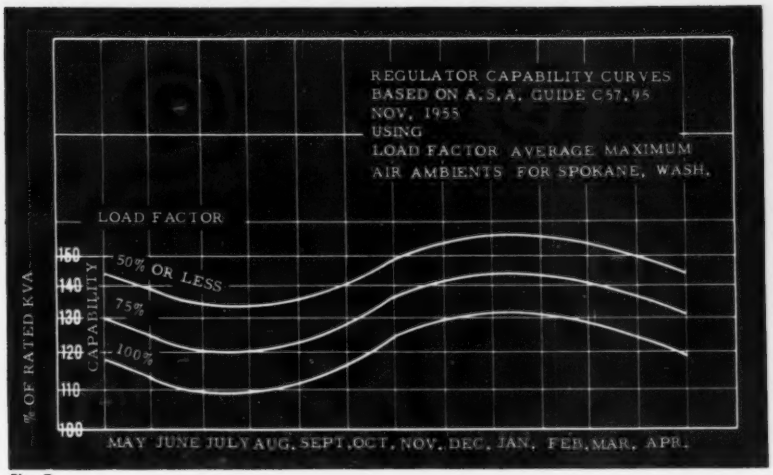


Fig. 7

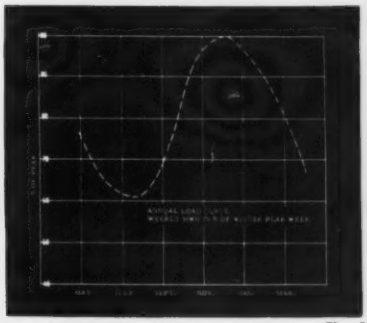


Fig. 8

Fig. 7—Regulator capability curves based on load factor for average maximum air ambients. Fig. 8—Annual load curve of weekly mwh in per cent of winter peak week

for the year were plotted in per cent of the peak week as shown in Fig. 8.

From this curve and the capability curves, it was then determined that the critical feeder peak generally occurred early in January, and that if a regulator was loaded to its full capability at that time it would be underloaded at all other times.

ASA guide is based on the use of average temperature values. Historical extreme temperatures for Spokane are −30 F and 108 F or −33 C and 42 C, respectively. Since temperature approaching extreme values are sometimes realized, it was decided to use average maximum instead of average values in making up the final loading curves.

Loading curve (Fig. 9) as finally plotted is for a ±10% regulator range of travel, a 72% daily load factor, regulator capability in early January, and the annual load curve as derived. Additional load carrying ability, based on thermal capacity, realized by limiting regulator travel to less than ±10% is also indicated. The 72% load factor was used because it was the greater of the two calculated and could thus be safely used for the entire year. The 72% load factor is thus a conservative value and, while a daily load factor of 72% is quite high, it is possible that a feeder with more diversity, such as residential-commercial feeder, might have an even higher load factor and consequently smaller capability. The above assumption thus allows something for this possibility.

The loading curve, as derived, has now been in use for several years with very satisfactory results. It is hoped that the successful procedures followed in this study will stimulate similar studies in developing more working guides for other utilities.

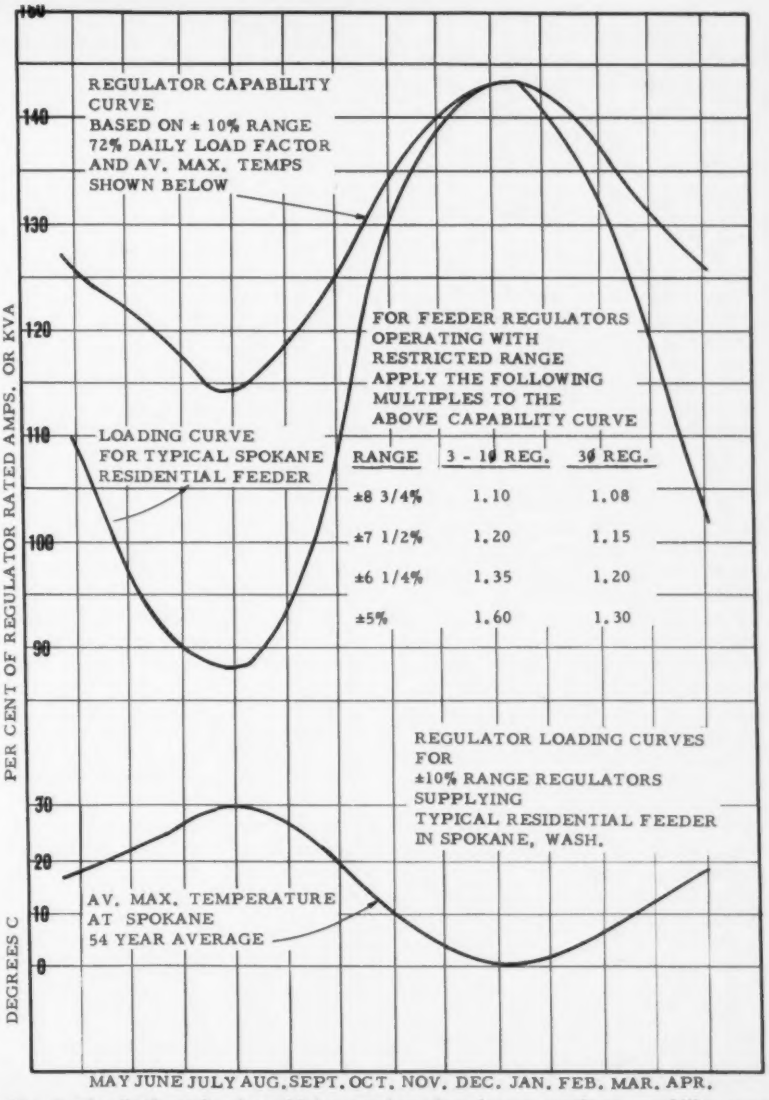
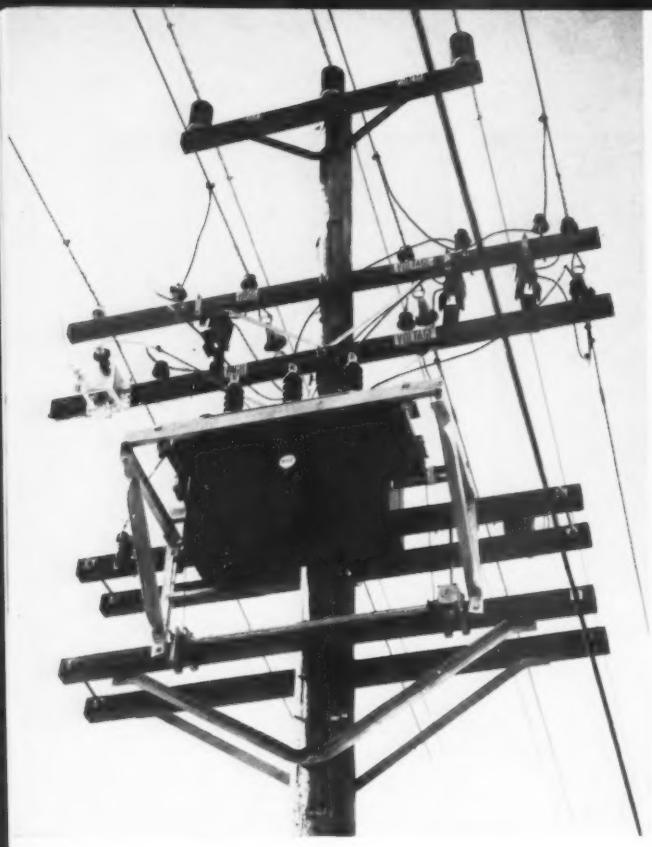


Fig. 9—The final result of combining previous data into a regulator capability curve based on loading and climatical factors for Spokane. This is compared against the loading curve for a typical Spokane residential feeder



TIME-DELAYED PICKUP

- **A new device that can be used with reclosers solves the problem of how to pick up a faulted circuit after loss of diversity ups inrush current**

- **Time-delayed reclosing operates automatically without costly manual procedures**

L. J. FLANIGAN
ASSISTANT OPERATING ENGINEER
CALIFORNIA ELECTRIC POWER CO.

The design of distribution systems serving all-electric homes must consider the new pattern of peak demand and diversity as well as voltage level and regulation. The step to "all electric" is usually the result of the addition of refrigerated air conditioning and electric space heating, or a heat pump.

The operating problems associated with the loss of diversity at times of circuit outages is increased by the accumulative in-rush currents from the thermostatically controlled motor-driven devices. The accelerated use of these motor-driven devices on some of our circuits made it necessary to experiment with the installations of automatically controlled sectionalizing equipment for quicker restoration of customer service.

In areas where there is the large peak demand from electric homes, the consequence of an outage on such circuits makes service restoration difficult and time consuming. During an outage, the thermostatically controlled devices will build up the pick-up loads in five to 10 minutes.

Manual sectionalizing to restore service is unsatisfactory because it extends the period of the interruption. Equally unsatisfactory are the operating practices of raising relay settings, of temporarily blocking automatic circuit reclosers or re-fusing branch lines with larger sized fuses. Of major consideration is the fact that the latter three practices may impair proper fault relaying for end-of-line faults.

This new technique of using automatically controlled reclosers for restoring service under the above conditions has been employed by California Electric Power Co. Two trial installations of automatic circuit reclosers have been installed to shorten the zone of fault protection of the substation circuit breakers, as shown in the simplified schematic diagram.

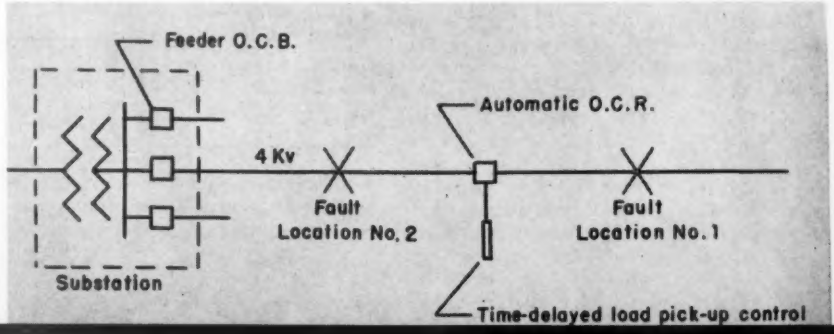
The reclosers are equipped with a time-delayed automatic load pick-up control. The sequence of operation when circuit faults occur follows:

Case 1. With a fault in the line section beyond the recloser.

With a permanent fault at location No. 1, the recloser functions normally as an overcurrent protective device and isolates the faulted section of line. After the fault has been cleared, the time-delayed characteristics of the recloser permits cold load pickup of the in-rush current in the line section beyond the recloser without relaying the substation OCB.

Case 2. With a fault in the line section between the station OCB and the recloser.

With a permanent fault at location No. 2, the station OCB functions normally as an overcurrent protective device and isolates the fault from the substation. After the elapse of a predetermined time-delay in the recloser load pickup control, the recloser is also automatically tripped. After the fault has been cleared, the line is re-energized to the recloser location. The station OCB is now capable of picking up the cold load in-rush current to the recloser location. Again after a predetermined time-delay, the recloser will energize the remaining section of line automatically. Thus, service to the entire circuit has been restored without resorting to the time-consuming practices outlined previously.



One-line shows application of reclosers with time-delayed pickup

ELECTRICAL WEST
Construction News

For
- contractors
- consulting engineers
- lighting engineers
- wiring designers
- distributor salesmen
- all interested

Change in dates for the National Industrial Service Assn.'s convention at Miami Beach has been announced from May 4-7 to May 8-11 because of conflict in hotel scheduling. Correction has been given us as to the date for changing the name of the association to Electrical Apparatus Service Assn. It will be effective April 1, 1961, instead of 1960.

To have Idaho manager

Intermountain Chapter, NECA, plans to have a branch manager for Idaho. The move was approved by the board at its recent meeting. Growth of the organization in that state warrants the change, says Ad Woolley, chapter manager.

Negotiations have started at Grand Junction between Local 969 and NECA. Another change in the area is that Norman Dean, business manager, has been assigned to take over Local 415 at Cheyenne. A successor had not been named.

Coming West

Frank Stetka, electrical field engineer, NFPA, is scheduled to attend and participate in the annual meeting of the Utah Chapter, International Association of Electrical Inspectors at Salt Lake City April 20, the Idaho Chapter at Twin Falls April 22 and then the Eastern Washington Chapter at Wenatchee, Wash., April 23. He has also attended the code school and annual meeting of the IAEI, Rocky Mountain Chapter, at Denver on March 3 and 4.

Win gold scroll

San Diego Bureau's Contractors Division was awarded a gold engraved scroll in the Look magazine competition "for outstanding performance among electrical leagues in promoting residential wiring."

In new quarters

Sacramento Valley Chapter, NECA, held open house Feb. 14 at its brand new association headquarters, 5300 Elvas Ave., Sacramento. At the time it introduced its new list of officers for the year: Robert D. Jewell, president; Leonard C. Wesleder, vice-president; Jack Gray, secretary; Rex Moore Jr., treasurer; Hugo E. Becker, governor; and Joe T. Krivanek, manager.

NAED meetings

Area meetings of the National Association of Electrical Distributors, according to Bill Jewell, regional manager, were held March 8 at Eugene for the Oregon group and another is scheduled for May 20-21 at the Flamingo, Santa Rosa, for the northern California group.

Whether acoustical contractors will be given a separate classification by the California Contractors State License Board comes up before a public hearing April 8. Opposition has been expressed by NECA's public relations

consultant, Ernest Kramm, to sections of the proposal that may overlap electrical contractor licenses as respect luminous ceilings.

IES slate

Two new regional vice-presidents of the Illuminating Engineering Society in the West are to be elected this year. Beverly Travis, Pacific Northwest regional vice-president, and Sam Hamel, Glendale, IES director, as well as Jerry Whitnell of Phoenix, attended the nominating committee meeting in New York for 1960-61 officers. Richard Slauer is the nominee for national president; Jack Cottingham of Portland, the vice-president for Pacific Northwest; Roy Kreyser, Los Angeles, vice-president for the South Pacific Coast.

Growing

Growing to become one of the largest independent chains of electric wholesale distributors is Electric Supplies Distributing Co. of San Diego whose president, Fred G. Goss, announced starting of operations March 3 in Tucson, Ariz., through a subsidiary Arizona corporation and that another is being formed to operate in El Cajon, Calif., April 1. This will give it houses in Anaheim, Arcadia, El Cajon, El Centro, Long Beach, Phoenix, San Diego, Santa Ana and Tucson.

Wanted: more light

Wanting more light on the city's streets, a delegation of citizens appeared at Los Angeles City Hall Feb. 17 to demand action. They contend that dark steets invite crime and produced testimony of people who had been beaten and robbed in the dark steets. The council agreed to investigate placing a steet lighting measure on the ballot soon.

Both Puget Sound Chapter and Oregon Chapter of IAEI met together March 12 at the Clark County PUD Building, Vancouver, Wash. The newly elected officers of the Oregon Chapter, Mel Evans, Portland General Electric Co., chairman; James Backenstos, vice-chairman, city of Portland, electrical division; and secretary-treasurer, Les Lynch, State of Oregon, safety engineer, conducted the meeting. Schedule for 1960 meetings was announced as April 16 at Eugene; June 18, Newport; Nov. 19, Portland.

Consolidating, not writing

Not attempting to write a uniform state building code is the State Building Standards Commission, Ernest Kramm, public relations consultant for the NECA chapters, explains. However, since there are some 30 administrative agencies in the state and 19 of these write and enforce building regulations and standards and there are likewise 11 government codes dealing with building regulations and some 12 general laws, this commission is seeking to sift the duplication, overlapping, conflict, etc., of these various rules and regulations and consolidate them into a single code for easy reference.

Elected

San Joaquin Valley Chapter, NECA, re-elected J. E. McCarty, Bright Spot Electric Co., Stockton, as its president at its recent annual meeting. Ray Hizen, Collins Electric, Modesto, was named vice-president; John W. Oneto Jr., Stanley Electric Motor Co., Stockton, treasurer; and Glen Bockmon, Bockmon & Womble, Stockton, governor. An additional director is Norval Gundershaug of Lodi. Matt Sherwood recently conducted a successful workshop on "Summarizing the Estimate" in Stockton, in which 13 contractors and estimators participated.

PRECAUTIONS WITH GROUNDED SYSTEMS

TOM HUGHES. ELECTRICAL SAFETY ENGINEER, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

Motors and Controls—XI

In the previous article we were discussing some of the safety problems involved in the wiring of control circuits for motors and what the National Electrical Code and the California Electrical Safety Orders required in these respects.

The Electrical Safety Orders have anticipated this use of a foreign source for the control circuit, in paragraph 2398 (h), which states that "Control circuits shall be so arranged that they will be disconnected from all sources of supply when the disconnecting means specified in Order 2399 is in the open position," and then some exceptions are given.

The California Division of Industrial Safety permits the choice of three alternatives for lessening this hazard. The first and most foolproof one is to provide a relay for each motor controller (mounted in a separate enclosure). The contacts of this relay are inserted in the control circuit conductors and the holding coil of this relay is fed from the particular motor branch circuit leads so that it drops open when that motor's branch circuit disconnect is opened, thus de-energizing the foreign circuit in that controller automatically.

This relay may be either a single-pole or two-pole unit (depending on the nature of the control circuit interconnections) but it must open all continuously or intermittently live wires entering that motor starter (controller) enclosure. In the event that molded case circuit breakers are used for motor branch circuit disconnects, some manufacturers can insert a small auxiliary switch in the circuit breaker case to open the control circuit as the breaker is opened. This would eliminate (or take the place of) the separate relay.

A second alternative is to have a separate, single-pole or two-pole (depending on nature of control circuit interconnections) switch alongside the starter enclosure to isolate the control circuit at the same time the branch disconnect is opened. This must be in a separate enclosure or of a "dead-front" design if mounted within the starter enclosure. (In other words: its live terminals must be concealed when the starter cover is opened.)

This auxiliary switch must be permanently identified as the control circuit disconnect and a permanent warning plate must be attached to the cover or door of the starter enclosure. This warning must have some such wording as (for example) "Caution: Control circuit is energized from separate source. Open control circuit disconnect."

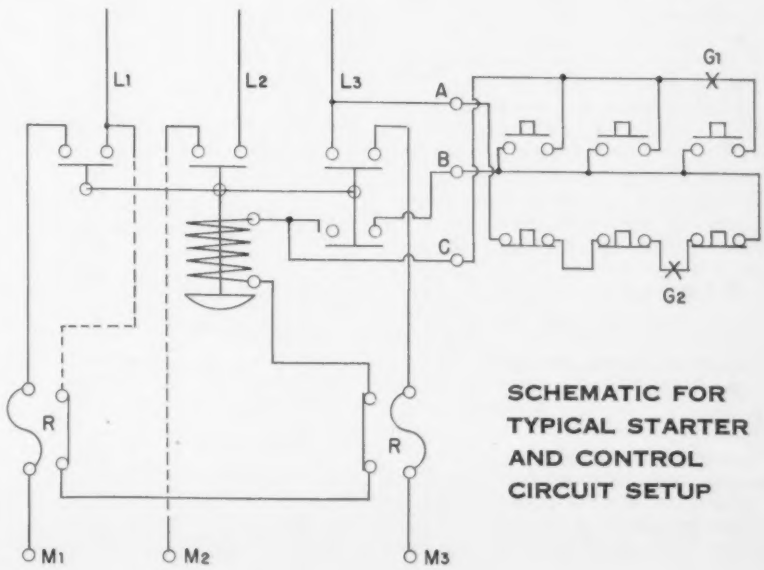
A third alternative is permitted where the starters for a group of interrelated equipment are mounted in the same cabinet or distribution center. Energy for the control circuits may be derived from a single source but must pass through a disconnecting means (suitably identified as the control circuit disconnect) at each group of starters or distribution center. A permanent warning plate must then be attached to the door of each starter in which foreign wires exist (unless auxiliary relays are employed as mentioned in the first example) or one large (unavoidably prominent) sign may be posted on the panel for the whole group, if all are concerned.

While we are on the subject of the supply for the control circuit we should mention one other item of safety to personnel and equipment. If the motors are being fed from a nominal 220-v delta secondary transformer bank, the rules of some states require that one corner of the delta be grounded on a straight three-phase system. When such is the case and the control circuit passes through metal raceways or enclosures, it is important (although no codes recognize the possible hazard) for this grounded phase always to be connected to a certain portion of the control circuit.

The figure shown is a schematic for a typical starter and control circuit setup. By following the wiring it is seen that one side of the control circuit originates at a tap from L_1, passes through the two thermal cutouts of the overload relay, and ends up as a fixed supply to one terminal of the holding coil. The other terminal of the holding coil receives its supply from a tap off of L_2 but is dependent on the continuity of flow through one of two paths made up by the various control devices.

It is noted that the supply wiring from L_1 is all within the controller enclosure and, in fact, is a permanent hookup embedded in the assembly by the manufacturer. Thus, there is practically no chance for it to establish a fault ground to the enclosure or raceway.

The other half of the supply path (from L_2 to the holding coil) may travel for miles through metal raceway and enclosures of control devices. Control devices are in small cases entailing crowded connections, with good chance for establishing a fault ground; especially if the race-



SCHEMATIC FOR TYPICAL STARTER AND CONTROL CIRCUIT SETUP

way is subject to moisture from condensation.

If an electrician wants to do a real job he should check the phase wires (of such a delta secondary with one corner grounded), determine the grounded phase and connect it to the terminal of the controller which corresponds to L_2 in our diagram. The arrangement of connections will differ in the controllers of various manufacturers but they always furnish a schematic and mark the terminals.

If you trace the circuits in the figure you will see that, if the grounded phase is connected to L_2 and an accidental fault ground occurs at G_1 or G_3, the fault return path will by-pass the holding coil and no abnormal operation of the starter will result. However, if the grounded phase is connected to either L_1 or L_3, a fault at G_1 will cause unwanted starting of equipment with attendant hazard or damage.

With the grounded phase at L_2 and a fault ground at G_2 a fuse would blow. On the other hand, with the grounded phase at L_3 and the fault ground at G_2, a stop button could not stop the motor. And so it can be seen that proper connections to control devices is important.

With the wye-connected secondary of a transformer bank supplying the three phase and the wye point grounded, we have a different set of conditions. There is no way to connect the starter or control circuit that will prevent a possibility of fault current flow through the holding coil in the event of a fault at G_1 or G_3. However, the voltage-to-ground is so much less than the voltage between phases (with such a setup) that the holding coil could not pull in unless the voltage regulation of the supply is very poor.

RADICAL NEW ORDINANCE IN SALT LAKE

LAURENCE E. BATY

Salt Lake City, Utah, began enforcing its new electrical ordinance shortly after the entrance of 1960. Some of the provisions have evoked debate but an inspector association leader in the area remarked, "I have heard arguments for years and will hear more. The point now is that an authority has taken a stand."

Some measures, such as the enclosed service, have been enforced for some time under departmental regulation and are just now receiving ordinance status. Others remain as powers in a corner which has not yet been swept out by a higher political body.

In deference to an old state contractor-licensing law having been legislated a set of dentures, the amended city ordinance dropped the traditional examination and licensing provisions. However, a requisite to application for a Salt Lake City electrical wiring business license (for general revenue) is possession of a license by the state department of contractors. Payment of a small token registration fee (for police powers) to the inspection department is all that Salt Lake City then requires.

Work done by sole owners for their own use is exempted from state licensing. The old ordinance had "maintenance" licenses, allowing qualifying licensees to do limited electrical work on specified premises. The new ordinance provides an "annual permit," at a negotiated fee, to employers of electricians assigned entirely to the employer's premises. Also, individual owners "who prove competent to do such electrical work" may secure separate inspection permits for work done by themselves on their own premises.

The previous provisions on emergency lighting, promulgation of rules by chief electrical inspector, acceptance of NECode as a minimum standard, etc., were continued.

Electrically operated snow melting, soil heating, and "labor saving" equipment were added to the classifications of electrical merchandise requiring inspection department approval before being offered for sale. Trailer houses were added by inspection department regulation. Periodic reinspection is specified for goods offered for sale and semiannual reinspection of emergency equipment and circuits.

The enclosed (raceway) wiring requirement in specified areas and occupancies was amended with respect to multifamily dwellings. The old ordinance required enclosed wiring where there were five or more units. A preliminary draft of the new ordinance had the provision reading "eleven or more." The final draft was made "six or more units" to meet objections from within the electrical industry.

An electric range circuit is now required in all new dwelling units unless the owner specifies "other facilities." A more sweeping provision in the earlier drafts brought objection from interests promoting sales of fuels other than electricity.

The main points of controversy are the moves in the face of tradition:

- **Minimum of 20 circuits for residences**
- **No main switch for up to 30 circuits**
- **All services must be in raceway**
- **100 amp for houses less than 1,500 sq ft**
- **200 amp for those over that**
- **Range circuit required**
- **Licensing and examinations by state**
- **Revolutionary new fee system**

NEC Sec. 210-6 is modified in the Salt Lake City ordinance to require special guarding when polyphase systems or voltages above 250 are employed in residential occupancies. This was primarily to allow installation of electrical and electrostatic heating and air conditioning equipment in residences.

All new services are to be enclosed metallic—rigid conduit, EMT or raceway. The minimum service in a single-family unit of less than 1,500 sq ft area requires conductors of 95 amp capacity, 1¼-in. conduit, and a 100-amp meter socket. Where the area is 1,500 sq ft or over, the minimum is set at 125-amp conductors, 1½-in. conduit, and a 200-amp meter socket. Inspection department regulations have required service and disconnecting means to be brought to minimum capacity if new branch circuits are added to existing work.

At least two 20-amp spare circuit breakers must now be included in each load center. The revised ordiance permits residential service disconnecting means to have a maximum of 30 breakers—in a common enclosure with common buswork—without a main switch. By department regulation or "interpretation": (1) it is mandatory to have at least 20 circuits in a residence; (2) no main switch is permitted if there are 20 or less circuits; (3) installation of main switch is optional for 21 to 30 circuits; and (4) installation of a main switch is mandatory if the residential service has more than 30 branches.

The framers of the ordinance defend the breaker provisions with the

following: (1) the quick disconnect doctrine is carried over from the days when electrical installations did not enjoy their present confidence; (2) emergency personnel (firemen) in the area make little or no use of service disconnect equipment; (3) multiwire branch and fixed appliance circuits, using proximity handles and ties, have the effect of reducing the apparent number of circuit breakers; (4) a greater number of circuits tend to increase probability of fault self-isolation without interrupting all essential lighting; and (5) NEC Sec. 230-73 allows emergency circuits to be connected on the supply side of the service disconnecting means.

Fee System Completely New

The old ordinance had a bracket system of inspection fees, requiring knowledge of the numbers of outlets, connections and circuits – all segregated by use, capacity and other considerations. The new fee schedules separate residential occupancies (characterized by rule of thumb planning) from the generally engineered construction of the other occupancies. There is no firm measure of fee equity between the two groups, or between contractor and owner fees in residential occupancy. Common provisions are: (1) a flat fee for special circuits to single appliances from existing service equipment and (2) waiving of permit requirements for minor repair work, partially defined as including addition of outlets up to the capacity of existing circuits.

Basic inspection fees to contractors for wiring in residential occupancies are measured by square footage of new structure and a flat fee for electrical renovation of existing buildings. Adders are applied in multi-unit dwellings.

Fees for new wiring installations (either original or extensions) on commercial and industrial property (including theaters, schools and hospitals) are based on the current carrying capacity of the largest ungrounded conductor in the installation. Normally, on original installations, the measure is applied to the service conductors. If high-voltage power is purchased, with transformation on the premises, the measure is applied to the low-voltage leads. (Rule—the largest conductor.) The inspection department has developed fee tables using NEC allowable current carrying capacity for various conductor sizes, insulations and wiring methods.

The dollar value of the inspection fee for new single-phase systems, or three-phase, four-wire, wye-connected systems, is determined by dividing the conductor ampere rating by four (i/4). The fee for three-phase power systems, or three-phase, four-wire systems from delta-connected banks, is set by multiplying the i/4 derivation by 1.7. Separate fees apply to each metered group. Where only the service facilities in existing installations are involved, derived fees are reduced by one-third.

It has been declared that the new fee schedules were drawn with a single purpose in mind—to simplify the appraisal process without altering the revenue. The factors were found through averages developed from field and record studies of actual installations in the area. Admittedly the new computation methods have produced some unexpected results—both ways.

Coffee break discussions at the inspector association meetings have developed that: equal load conditions do not have fee equity; there is no such thing as identical loads for comparing single phase, three phase, or the two three-phase, four-wire systems; a fee based on service conductors, engineered for voltage drop and heat dissipation under assumed load duration conditions, cannot be expected to agree in every case with a fee based on a hybrid system of connected loads, average loads and number of places where a load might be applied; the step to simplify is to be commended; there could be a different set of factors; and no other proposed single-approach system can stand any closer scrutiny.

In the past, various factors have led to requests for fee adjustment after job completion. Then, too, the sheer magnitude of some projects led to disagreements in outlet and circuit counts. Under the revised fee schedules, it is expected that there will be fewer chances for difference between contractor and inspector, that fee appraisal will be less laborious, and that fees and permits can be cleared by mail.

SALT LAKE CITY CORPORATION
INSPECTION PERMIT FEES

Residential and Multi-Unit Dwellings

Minimum fee involving Electrical Construction	$ 5.00
Computing of Fee (See Bldg. Permit) per sq ft	.01
Permit for Electrical System Renovation	
Existing Structures up to and including 3 meter loops	10.00
Additional Meter loops and associated wiring—each	6.00
Owner's Permit—one appliance to existing system	5.00
Owner's Permit—renovation of wiring system	9.00
Owner's Permit—renovation including meter loop	12.00
A Single Circuit addition, not involving Service Change	2.00
Temporary Meter Loop, or clearance to panel independent of routine inspection service	5.00

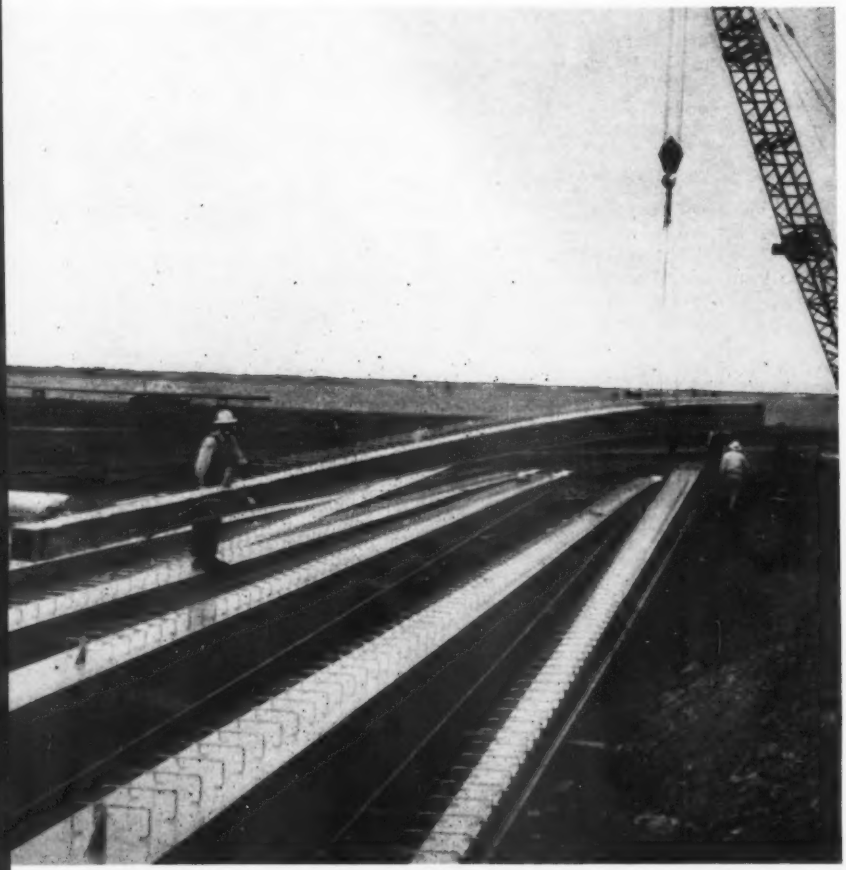
ELECTRICAL PERMIT FEES

AWG Wire Phase	Single Phase		Three Phase	
No.	TW	RHW	TW	RHW
10	$ 6.00	$ 6.00	$ 10.00	$ 10.00
8	7.00	10.00	12.00	17.00
6	10.00	12.00	17.00	21.00
4	13.00	16.00	23.00	27.00
2	18.00	22.00	31.00	38.00
1	21.00	25.00	36.00	42.00
1/0	25.00	30.00	42.00	51.00
2/0	28.00	33.00	49.00	57.00
3/0	32.00	38.00	55.00	65.00
4/0	38.00	45.00	65.00	76.00
250 mcm	42.00	51.00	72.00	87.00
300 mcm	47.00	57.00	80.00	97.00
350 mcm	52.00	62.00	89.00	106.00
400 mcm	56.00	67.00	95.00	115.00
500 mcm	65.00	77.00	110.00	131.00
600 mcm	71.00	85.00	121.00	142.00
700 mcm	77.00	94.00	131.00	159.00
750 mcm	80.00	96.00	136.00	163.00

Photo by San Francisco Examiner

With light from 1,147 units with 1,500-w lamps on eight towers for night baseball at San Francisco's new 45,000-seat stadium . . .

PLAY BALL! GIANTS ARE READY

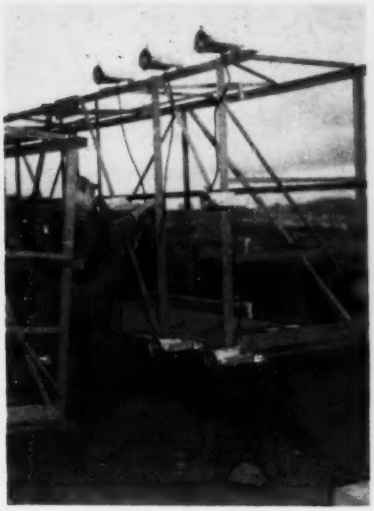


Baseball season opens this year with the San Francisco Giants in Candlestick Park at last after a "rhubarb" of Giant proportions, without which it wouldn't be baseball. It was planned to have it ready last fall in case the Giants won the National pennant. They didn't and the rhubarb went on but the stadium is now ready. Batter up!

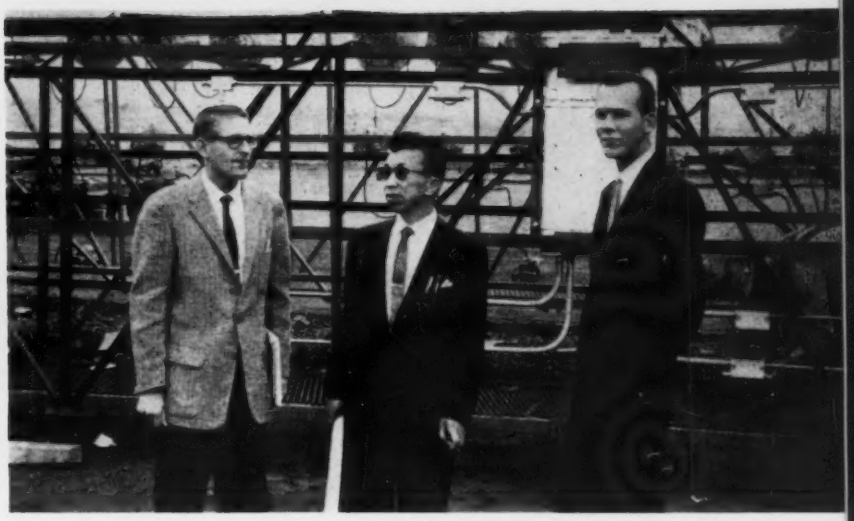
To light the night games the electrical engineer, Lyle Patton, went through quite a rhubarb as well. Original designs would have placed the banks of floodlights above the lip of the grandstand canopy and windbreak but posts for support would have been required. To obscure no one's view meant placing much higher towers (232 ft above the field level to clear the canopy) and sacrifice of some light because of the inverse square law.

Each tower consists of either two or three fabricated welded steel posts and a structural steel rack and catwalk upon which the floodlights and the weatherproof cabinets containing the contactors to control them are mounted. The eight towers have four to seven such contactor panels,

Welded fabricated steel posts, two or three to a tower, had conduit, service head and wire preassembled on the ground



Lamp sockets pre-aimed as mounted on rack



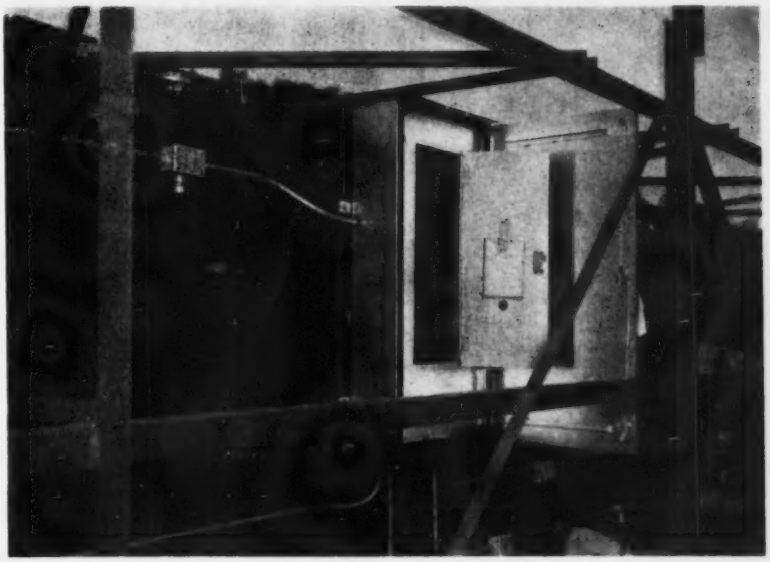
John Zeiter, Kin Chuck of Patton's staff and Reed Hanson, Westinghouse, before rack

and four to six rows of lamps mounted on the frame of the rack. These can be adjusted and serviced from the catwalk. To reach the catwalk, ladder steps have been welded to the individual tower posts. The tallest of these is 106 ft high and sets on brackets back of the stadium, 40 ft above the ground. The widest catwalk is 75 ft and contains 230 units and has 52 circuits from seven panels. Except for four aimed below for general illumination the 226 others are operated 10% overvoltage to produce 30% more light. A total of 1,147 units with 1,500-w lamps is used.

A unit substation is located near the foot of each tower, eight in all, ranging in capacity from 750 to 225 kva. Primary is at 15 kv and comes underground from the main switchgear at one of the substations. Utility service comes from two separate networks to insure continuity.

The contractor, George F. Brayer, wired the poles and the floodlight structures on the ground before they were lifted and electricians climbed the towers to make final connections and to adjust the aim of any of the lighting units. However, calculated in advance, the lighting units were very precisely aimed before being lifted into place, it was found. Lighting equipment and switchgear were of special Westinghouse manufacture. Towers were fabricated by Weld-Rite in Oakland in sections and then welded together on the site.

Other electrical features include a large scoreboard and radiant heating cable cast in the players' benches. Parking area lighting is mercury on street lighting standards.



Each lamp rack structure has three or four panels for remote control contactor housing

Crane lifting one of posts onto bolts of base. In background, one of the unit subs

PCEA Business Development Section prepares to

SELL ALL ELECTRIC *ALL* THE WAY

It was no more lip service that was given the idea of a coordinated program to sell all electric all the time at PCEA's Business Development Conference in Long Beach last month. There was conviction in what was said both at the formal meetings and at between session confabs, where the words "our industry" were heard oftener than "my company."

In the belief that climate control is the key to the all-electric home, Section Chairman H. L. Moore and his program planners turned over the opening general session to the electric heating and air conditioning committee.

J. C. Beckett, Wesix, set the stage for the presentation and brought a rueful smile to many a face as he played taped conversations that were real business stoppers. Represented were the old-fashioned electrical contractor, the utility representative and others who in the past have discouraged electric heat in face of customer interest.

Estimating that less than 1% of the homes in PCEA territory are electrically heated today, Beckett predicted that this situation will change in the next 10 years because the last five have shown that the public wants it. It's more expensive but not much more and the customer thinks it's worth it. It is the industry that is gun shy, he said.

Speaking as an electrical contractor who has found profits in electric space heating, H. W. K. Wittner, president of Bill Wittner & Son, Redding, pointed out that for other contractors also there is gold in this business. A tract home wired for electric heat is also wired for ranges and water heaters; the job brings $700 instead of $200 and the door is opened to sales of built-in appliances, he stated.

His advice to contractors: get specific rate information from utility representatives; remember insulation is a must; install enough heating capacity; use the sales aids manufacturers furnish; promote in store displays and through local newspapers; if not selling electric heat now, get busy on a Gold Medallion home and prove its advantages.

An architect's view of the heat pump was given by C. J. Paderewski of Paderewski, Mitchel, Dean & Associates, San Diego. Conditions are ideal for it, he believes, when a large cooling load is demanded, with large volume of air for proper ventilation and a small heating requirement. Installation cost and space savings, safety and cleanliness are factors. Operating costs are low where heavy heat loads are not required.

Selection among types of heat pumps, he said, depends on heat source, method selected for inside distribution and climate conditions (for air type). Air as a source of

Chairmen and Tuesday luncheon speakers, left to right, above and opposite page—V. W. Hartley, PCEA managing director; W. F. Chapman, San Diego Gas & Electric, residential group chairman; C. F. Black, Rome Cable, chairman, agricultural, commercial and industrial groups; F. M. Falge, General Electric, section vice-chairman; H. L. Moore, Southern California Edison, section chairman; J. G. McKinley, Westinghouse; J. E. St. Lawrence, G-E; Ralph Zeuthen, manager, LBE program, EEI

heat is most popular, easier to maintain, has fewer service problems; is most efficient for areas with 30° minimum temperature or when heat pump operates above the point of balance; with supplementary heat can be used effectively for lower temperatures.

Water is the best heat source if available in dependable quantity, good quality and at proper temperatures, he said. It provides good balance between heating and cooling capacities and is especially good in the northern climate. Well water is most desirable because it maintains fairly constant temperatures; it should be noncorrosive, nonscaling and available at 50 to 75 F throughout the year.

He suggests an air to air or water to air system if indoor air handling units are direct expansion coil type; air to water or water to water system if water coils are used within indoor air handling units.

Supplementary strip heater sections usually are necessary if temperature is below 30 or 35. If operating costs are to be maintained within economical limits, they should not be used for more than 40% of design heating requirements or more than 10% of the heating season, he said.

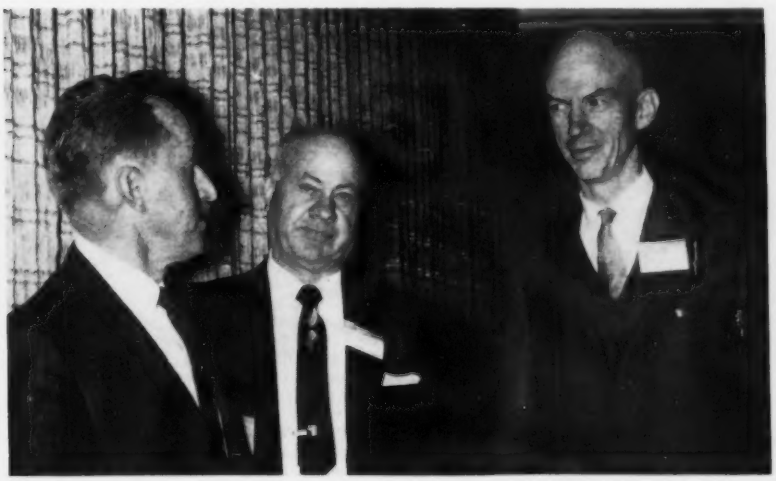
To the Tuesday general session, speakers brought details of three national umbrella promotions: the Westinghouse Total Electric Gold Medallion; the G-E Residential Market Development; the EEI Live Better Electrically.

Because it wanted to show that Total Electric Living is for every location and every purse, Westinghouse retained five leading architects to design 16 homes in different sizes and styles and in three price ranges. Each was to make full use of electrical things now available and to incorporate practical new ideas. A hint of the results in plans that can be adapted or followed exactly by builders was given in drawings shown by J. G. McKinley. Two of the architects, he said, are in the West: A. Quincy Jones, Jones & Emmons, Los Angeles; and John M. Morse, Bassetti & Morse, Seattle.

Westinghouse will concentrate its sales effort in 50 key markets with a spring drive and a National Home Week campaign, McKinley said. However, millions of other prospects will be reached through the company's weekly TV program and in magazine and newspaper advertising.

Liberal doses of Medallion Home and LBE pep pills will overcome the industry's tired blood, J. E. St. Lawrence, G-E, Louisville, told the group. His company now feels that the best way to tackle the problem is to go to new home builders, who are asking for ideas because they realize that quality homes are selling while others are a drag on the market. The consumer, who has the greatest stake in the project, is seeking a status symbol, he said, and the electric industry has an opportunity to make the Medallion Home not just an image but the complete substance. What the consumer gets from a Medallion Home was shown in a 7½-minute movie, Symbol of Better Living.

Ralph Zeuthen, recently appointed manager of EEI's LBE program, reported that changes are in prospect for its advertising campaign. Reminding the group that about 95% of purchases for the home are initiated by women, he said that a



Above: General session speakers Paderewski, left, and Wittner, with Chairman Beckett

Opposite: PCEA President Wikle, center, chats with H. L. Moore, section chairman, right, and D. B. Wheelock, California Electric Power, before the opening of the conference

A. A. Mesko, Hotpoint; L. S. Prince, WESCO

Evelyn Conant, Edison, and Helen Taaffe, Westinghouse, home economics committee

study had been made to determine what is in the minds of these consumers. Since Mrs. America sees herself as a hardworking shop keeper, not a chore doer, efficient operation, family benefits, human values are to be stressed. The term Live Better Electrically is usually accepted as a warm, happy attainable goal, surveyers found. Asked what the term modern living means, 60% said modern appliances. A group of half electric and half gas range owners were asked which is more modern; 81% of the electric range owners and 69% of the gas range owners said electricity; gas was the answer from 1% of the electric owners and 6% of the gas owners.

Residential

Drafted at the last minute to pinch hit as moderator for the residential wiring committee, Al McCutcheon, San Diego G&E, ably outlined the proposed five-year program to improve residential wiring in PCEA territory. Industry representatives made their first planning reports.

Describing the electrical contractor as a small independent businessman who in a profitless prosperity often engages in unconscious philanthropies, A. L. Berg, Berg Electric Corp., made these suggestions: glamorize residential wiring for the contractor, convince him that it can put him into NEMA's stage 4 ($500,000 business and over); strengthen communications with the industry; get uniform codes for PCEA area; work together for contractor recognition and acceptance; make him a better salesman by developing an educational program, perhaps with NECA.

Speaking for the manufacturers and distributors, Charles Croft, Square D, pointed to their stake in materials and appliances that can be sold only if the wiring system can accommodate the additional load. Their principal function, he said, is to recommend methods, encourage use of latest type expandable equipment, back up the contractors in every possible way. This encouragement and recommendation should be a continuing action, he believes.

Reporting on the utility section's long-range objectives and responsibilities, V. F. Martin, Southern California Edison, said his group would utilize existing materials to educate and motivate electrical contractors; would distribute latest information on new approved wiring practices; disseminate market information; make available to FHA, VA, NAHB and other agencies information upon which they can base changes in acceptable wiring practices; present to appraisal, fiscal and builders groups talks or illustrated lectures showing the value of good residential wiring.

It is the hope of the committee, Martin said, that ultimately it will have such stature that new devices will be referred to it for endorsement.

Pointing out that it will take a lot of selling to get lighting its share of the consumer dollar, T. D. Churchill, EEI, reported that the number of sockets per home is declining, urged better than minimum standards. He suggested a return to the use-the-user idea by making it easy for industry employees to get light for living in their homes. Since the average person is a status seeker, 20% on the street will blossom out with more light after one home has been given light for living.

We cannot afford to lay an egg in any part of our lighting promotion, he said, and the surest way to avoid it is for the sponsor to cackle about it. EEI is doing that, he said, and it is "up to you to make the seed grow and reap the harvest."

Calling lighting a sensation, not a product, Jerre C. Blair, G-E, suggested letting the customer experience it in light for living centers, even small ones set up locally by utilities and manufacturers. Although we keep talking of residential lighting as a load builder, it is even more profitable as a peak stabilizer, he said. Coupling indoor and outdoor lighting results in a load that will pull the valleys up.

The Academy of Lighting Arts in Action was presented by Robert Haskell, PG and E, whose demonstrations entertain while they make their point.

Dealer Training

Hotpoint's John Coppinger outlined his company's dealer management training course in a talk that brought after session questions and discussion. Purpose of the program is to give dealers integrated knowledge, skills, habits and attitudes necessary for them to operate at a profit. This includes knowing at any given moment the financial status of the business, its place in the market, its objectives, responsibilities of employees.

As Coppinger explained it, Hotpoint does not accomplish this goal with words alone; it puts retailers

Committee Chairmen

Following are chairmen and vice-chairmen respectively of the committees: *Heating and Air Conditioning*—J. C. Beckett, Wesix; R. V. Southworth, Sues, Young & Brown; *Residential Lighting*—R. L. Sawyier, PG and E; A. O. Grotenhuis, Thomas Industries; *Agricultural Electrification*—R. R. Whittaker, California Electric Power; R. L. Saling, Westinghouse; *Power Utilization*—Paul H. Henrichs, Southern California Edison; U. G. Karrer, PG and E; *Appliance*—W. A. Mayben, Graybar; F. E. Lucking, California Electric Power; *Commercial-Industrial Wiring*—L. S. Prince, Westinghouse Supply; J. B. Caldwell, Okonite; *Commercial-Industrial Lighting*—J. D. Whitnell, Arizona Public Service; F. J. Bertolone, Curtis-AllBrite Lighting; *Commercial Cooking*—Otis R. Monroe, Southern California Edison; Stanley O. Blois, PG and E; *Residential Wiring*—C. O. Walther, Zinsco Electrical Products, and R. E. Riley, Anaconda Wire & Cable, co-chairmen; *Home Economics*—Evelyn R. Conant, Southern California Edison, and Helen R. Taaffe, Westinghouse, co-chairmen.

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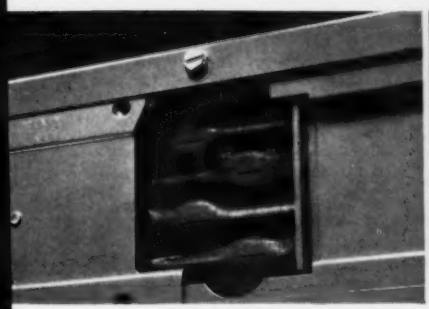

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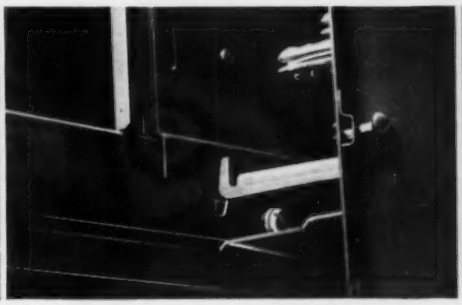

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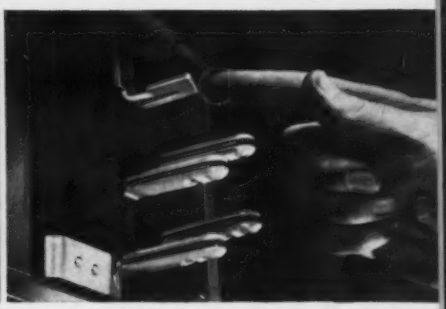

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910-89th Avenue
Oakland 21, California

BullDog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

KEEP PACE WITH ELECTRICITY

Charles Croft, Square D; V. F. Martin, Edison; C. O. Walther, Zinsco Electrical Products; Al McCutcheon, San Diego G&E; A. L. Berg, Berg Electric Corp., residential wiring group

Above, James B. Caldwell, Okonite; Otis R. Monroe, Edison; Paul H. Henrichs, Edison; U. G. Karrer, PG and E, at meeting of commercial and industrial group

Below, T. D. Churchill, EEI; Jerre C. Blair, G-E; A. O. Grotenhuis, Thomas Industries; Robert Haskell, PG and E; R. L. Sawyier, PG and E, residential lighting panel members

through the actual experience of solving problems in budgeting, sales forecasting and other areas that have pulled down business performance.

Turning to our exploding population, Coppinger broke down 10-year expected growth figures to show what this means in potential business for dealers in the area. Copies of the expected growth and of Hotpoint's 10-year forecast of industry appliance factory shipments were given out at the meeting.

Underlining the moral of the housepower skit put on by the home economics committee was the difficulty in getting 220 into the meeting room in time for the show. Clever lines and able performances by Dorothy Fuhrman and Elizabeth Novak of Edison served to drive home the point.

Commercial-Industrial

Automatic crop irrigation was treated by Henry R. Sander Jr., Shur-Rane Department, John Bean Division, Food Machinery & Chemical Corp., San Jose, who described the system developed by his organization. Stimulated initially by possibilities of labor saving, company engineers soon realized that there was an even more intriguing possibility in the use of this system, Sander said. For the first time at a reasonable cost the irrigator has a system that enables him to produce optimum conditions of soil moisture for an entire growing season, he continued.

Major benefits of the system the company believes are: (1) possibility of increasing quality and yield of crops through optimum soil moisture control; obvious and substantial labor saving; substantial water saving over present methods.

In a talk titled "Automate the Cow? Be Careful," William Z. Holm, president of Ross-Holm, Petaluma, pointed out that automation, like mechanization, in the dairy barn, must not be implemented as a labor saver, an incidental. He said it should be used where mechanical judgment is more accurate and consistent than human judgment and where it allows the necessary freedom or flexibility to care for each cow as her differences demand.

Describing his company's milking method, he explained that feed is automatically metered to the cow as she milks in accordance to what she produces. This is the first time, he said, that performance has been translated into electrical impulses.

Livestock feed handling studies

The shape of things to come from BullDog

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BULLDOG ELECTRIC PRODUCTS DIVISION
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made by his company were reported by Bernard D. Johnson, PG and E, who explained that such flow studies were made to serve the customer; to understand more about mill operations and farming techniques; to build load. While observing the operations and conveying system of a plant, company representatives are made aware of sales opportunities. In most cases, feed mills are good prospects for additional electrification, he said. To date the company has completed 13 flow studies, located in almost every part of its service area. In all cases they were appreciated, Johnson said.

Whitecap, a system of air conditioning operators of all heavy machinery, was described by Robert C. Mueller, manager of marketing for Jamieson Laboratories, Santa Monica. Air is filtered, cooled and directed into a pilot type helmet on the operator's head. The refrigerator-blower-filter machinery is wired into the ignition system of the equipment being used; is easily moved as work load shifts.

Power Utilization

W. S. Montgomery, Hevi-Duty Electric Co., outlined the points of difference in heat treating equipment, discussed the types of processes that lend themselves more favorably to electric power, such as vacuum furnaces and large salt bath furnaces.

Semiconductor rectifier devices have changed the field of industrial applications of d-c by providing a cheap and flexible rectifier that works in conjunction with any transformer, Edward J. Diebold, International Rectifier Corp., pointed out. Therefore any transformer and circuit breaker combination can become a source of d-c by the addition of these rectifier cells.

Great effort has been made by industrial users, equipment builders and manufacturers to translate promises into practical results, he pointed out. Each field of application presents its own difficulties and opportunities. Diebold feels, however, that the present state of the art and its acceptance clearly indicate that semiconductor rectifiers have kept their early promises.

Pointing out that since the modern industrial plant is completely dependent upon its power supply, managers complain about momentary voltage dips that may be barely visible to the eye, S. H. Gold, California Electric Power Co., said that the utility, the customer and the equipment manufacturer must work together to solve this problem. As he sees it, manufacturers must provide equipment that is compatible with practical power system designs; the customer should be aware that cooperative effort is required and that the serving utility must have his help in giving reasonable and satisfactory service, that no matter how much money the utility spends, it cannot prevent dips and short interruptions; the utility must take the initiative in discussing the problem and providing for its solution while the plant is being designed.

Wiring Program

Introducing the commercial-industrial wiring committee panel, L. S. Prince, WESCO, reported progress on the program to carry the adequate wiring story to the building user. So far, he said, the committee has directed its attention to phase 1, the establishment of standards. While it is ready for stage 2, a program for awarding a suitable Medallion to a complying builder, the committee believes it is more important "to aim at specific targets with a rifle than to shoot a shotgun in the general direction of what we want to hit."

Continuing the discussion, James B. Caldwell, Okonite, said there are two principal targets. The first involves selection of application categories for which specifications for adequate wiring can be prepared; the second is the group of people who must sell this program. The NLB and NWB programs contain about 50 to 100 application categories; are too complex to be readily salable, he said. PCEA is trying to limit categories to about 10, including retail stores, office buildings, restaurants and light industrial properties. These categories will be divided by size.

"We can fire with this," declared R. C. Gunning, Larsen-Hogue Electric, in outlining the standards recommended, using as a pilot project a 15,000-sq-ft building for an occupancy similar to a retail store. A program to improve the standard of the initial electrical installation in all types of commercial and industrial buildings is desirable for the customer and the industry, he said.

Lighting

Results of last year's commercial lighting campaign in San Diego Gas & Electric Co.'s service area were given by R. J. Huff of that company. Direct mail to customers and allied trades people reached about 8,000 persons a month. Two lighting training courses for architects, draftsmen, electrical contractors and others drew an enrollment of 66. As a result, commercial lighting kwh sales increased 14.5% over 1958 and average annual use per customer was up 7.5%. There was a 6.6% increase in number of customers. Many of the installations measure well over 100 f-c, Huff said.

Lighting shows, when properly organized, have dramatic results but the price of success is careful planning, according to Fred J. Bertolone, Curtis-AllBrite, who with Grant N. Radford, PG and E, reported on a series in the San Francisco area. It is necessary to start planning at least six months ahead of the show and to begin advertising at least three months in advance, he said. Sometimes it is better to charge a nominal admission to quicken interest, and in lighting costs it is well to remember that manufacturers do not have unlimited funds for lighting shows, he advised.

Basics of Arizona Public Service Co.'s lighting sales campaign were reviewed by J. D. Whitnell. Organization, education, follow through, coordinated advertising, salesman incentives were points covered in the talk and in slides. As for results: on a quota of 3,860 kw, 5,009 kw were actually sold, bringing EAR of $225,000 for a promotional expense of $7,200.

Commercial Cooking

Fitting close to a commercial-industrial meeting devoted to selling all electric all the time was the dynamic talk given by A. A. Mesko of Hotpoint, a veteran food service man who knows the business from an operator's standpoint and whose present job is to promote new ideas for that industry.

Food service is big business, Mesko declared, and its survival depends on service. Without mincing words, he stated that gas is on the defensive but it is up to the electric industry to get in and sell. So far as price goes, he reminded that "you don't expect to get a Cadillac for a motor bike's cost." Billions of revenue is waiting for somebody to shake the tree, he pointed out, and what is needed now is imaginative salesmanship backed by top management support.

The electric industry must tell the whole story, he declared, and if it includes the disadvantages of gas, be sure to be "damned enthusiastic about it," he added, because this is war.

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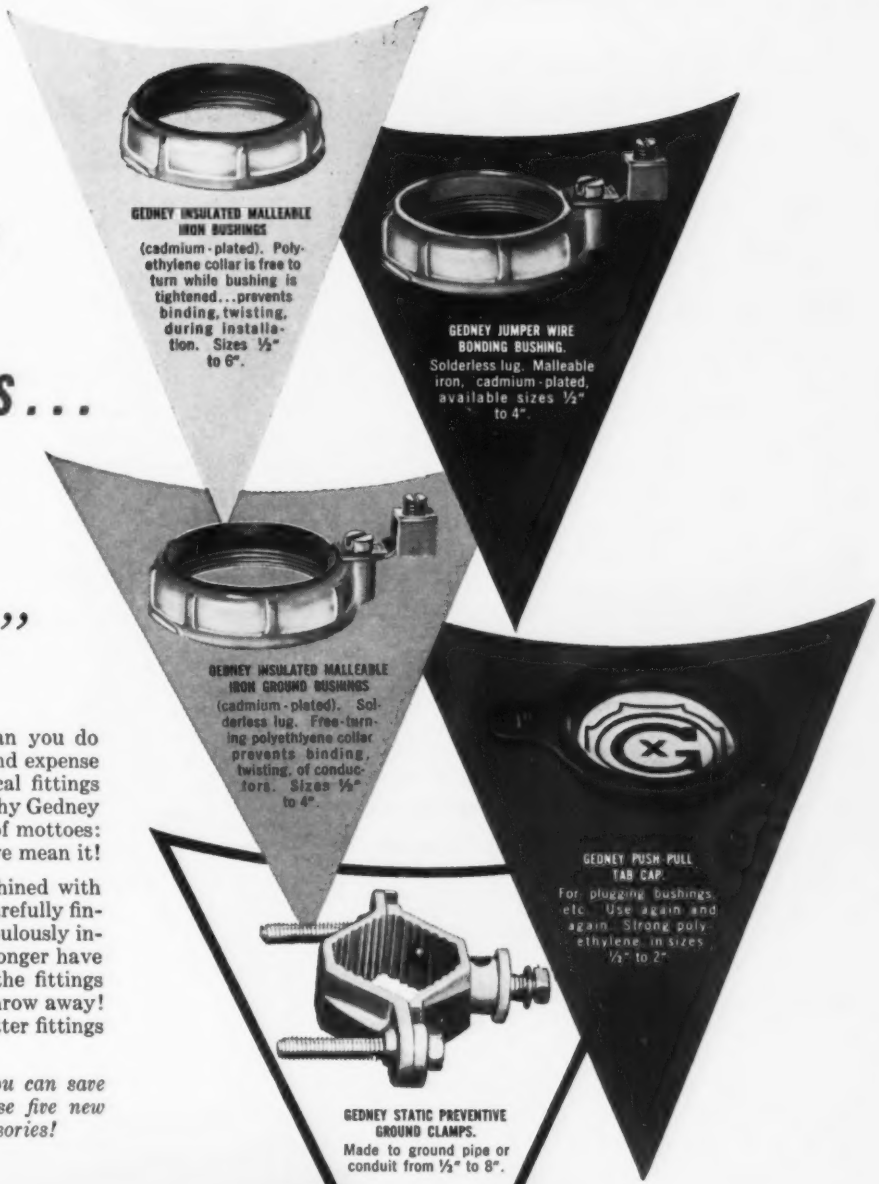

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GEDNEY PUSH-PULL TAB CAP. For plugging bushings, etc. Use again and again. Strong polyethylene. In sizes ½" to 2".

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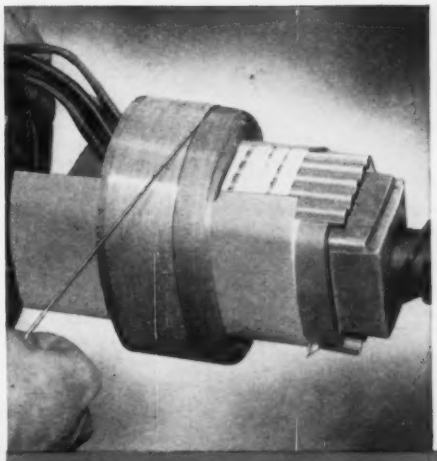
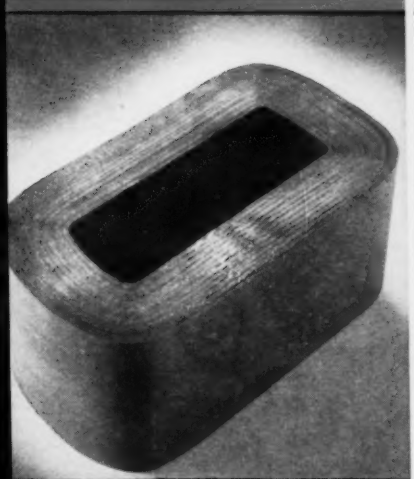
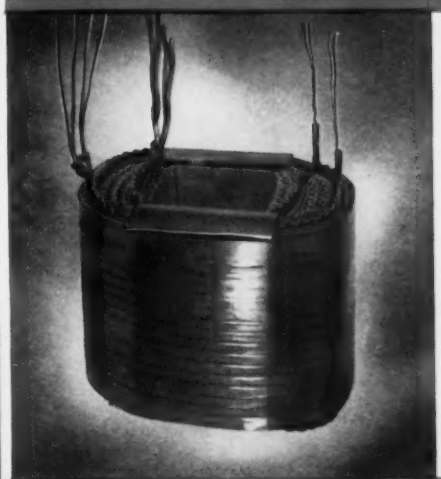


4 High Impulse Strength

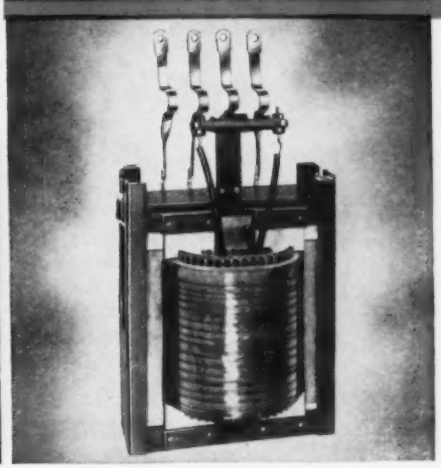
At the line ends of the high voltage coil, extra insulation is provided between layers of the winding, and cording is placed between adjacent turns. At higher voltage ratings the high voltage winding is sectionalized to reduce the voltage between adjacent ends of succeeding layers. This practice reduces the turn-to-turn and layer-to-layer stresses and, consequently, gives the coil high impulse strength.





5 Low Impedance, Improved Voltage Regulation

The low-high-low sequence coil design used in Moloney Distribution Transformers is one of the contributing factors to low impedance. Because of this low impedance, Moloney Distribution Transformers have a lower internal voltage drop under all conditions of load. The result is improved voltage regulation which means customer satisfaction and increased revenue.



6 High Efficiency

The efficiency of any transmission and distribution system depends wholly upon its components. The high efficiency of Moloney Distribution Transformers, resulting from low total losses, is one of the reasons why Moloney Transformers, installed in your system, afford . . . "More Power To You."

PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Over 45,000 ft. of Spang Steel Conduit will provide top-quality wiring protection in this new apartment building.

STEEL CONDUIT DOES A BETTER JOB FOR YOU

(*especially when it's SPANG®!*)

WHEN YOU BUY STEEL CONDUIT . . .

. . . you're buying conduit with the inherent strength of steel. It resists damage from rough handling at the job site, and has great structural strength when installed.

Steel conduit has high corrosion and chemical resistance, is not affected when buried in concrete or slag. It has excellent electrical characteristics, good conductivity and high resistance to arcing and short circuiting of its conductors.

Steel conduit is adaptable to every type building construction, and provides long and satisfactory service life.

WHEN YOU BUY SPANG STEEL CONDUIT . . .

. . . you're buying steel conduit that's uniform throughout, thanks to careful quality control. It's easy to bend, cut and thread, helping save construction time.

The superior Spang hot-dipped galvanized finish resists chipping, flaking and peeling even on the severest bends. The extra coating of clear lacquer provides even greater surface protection. The smooth interior finish promotes easy wire pulling.

Spang Steel Conduit is known by electrical contractors everywhere as a top-quality product that assures a good job every time!

MAKE SPANG YOUR FIRST CHOICE—ALWAYS!

Your local Spang Distributor will give you top-quality service on your Spang order. Next job: Make it Steel Conduit . . . Make it Spang!

SPANG® CONDUIT

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

People

Clinton Succeeds Larson At Salt Lake City

E. O. Larson, USBR regional director in Salt Lake City and known there as "Mr. Reclamation," retired March 1. He was succeeded by Frank M. Clinton, who had been director of Region 6 at Billings, Mont. since 1954.

Larson had been with the bureau for 39 years and at Salt Lake since 1943. Clinton joined the bureau in 1937 as inspector on Bartlett Dam in Arizona.

► **Dr. Gordon Shrum,** dean of graduate studies at University of British Columbia, has been appointed chairman of the five-man energy board being set up by the provincial government to advise on power development, production and use.

► Appointment of **Cliff Burnip** as sales supervisor of the B. C. Power Commission has been announced. For several years he has been in Nanaimo, B. C., as sales representative in the commission's largest power district. In his new position, he will move to the head office at Victoria.

► **Lauran G. Clapp** has been named to the newly created post of community relations director, San Diego Gas & Electric Co., Ralph J. Phillips, vice-president—sales, has announced. Prior to his appointment, Clapp had been serving as public relations director, San Diego Transit System.

► **Herbert C. Purcell** has resigned as chief electrical engineer for Sacramento Municipal Utility District to accept a position as assistant manager of the Golden Valley Electric Assn. in Fairbanks, Alaska. Purcell has been with SMUD since 1946, starting as system design engineer.

► **John S. Anderson** has been promoted to superintendent of power for Utah Power & Light Co., succeeding Harry H. Krueger. Krueger, who has been with UP&L since 1914, will remain as a power department consultant. Anderson, who had been assistant superintendent of power, joined UP&L in 1948. Also announced by the utility was the promotion of **J. C. Condor,** steam production engineer, to steam production supervisor.

► **Robley C. "Bob" Woolverton,** paymaster for the Los Angeles Department of Water & Power, retired in March after 36 years' service.

► **Marguerite "Maggie" Wall,** San Diego Bureau of Home Appliances, was elected a national director of the Electrical Women's Round Table. First chairman of the San Diego EWRT Chapter, she has been with the bureau for nine years. She formerly was with the local Westinghouse distributor.

► **W. A. Huckins,** formerly manager, business development, Utah Power & Light Co., was named vice-president and public relations director of Valley State Bank, South Salt Lake City. He retired from Utah Power & Light last December.

► Appointment of **R. M. Bibbs** as administration manager of B. C. Electric's electrical division was announced by J. H. Steede, vice-president and chief engineer. Bibbs was formerly assistant general manager of B. C. Engineering Co. Ltd. Earlier he was executive assistant to the vice-president and executive engineer of BCE.

► **Orville Ward** has been elected president of the newly formed Salt Lake Section, National Association of Power Engineers. **George W. Asher** is vice-president; **Donald Johns,** secretary; and **Oliver Carlsen** treasurer. **J. D. Holmes,** Newark, N. J., past national president of the group, installed the new Salt Lake Chapter.

► San Diego Gas & Electric Co. has appointed **Marvin E. Musgrave** to the newly created position of labor relations supervisor. **Ronald R. Shelby** will succeed him as employment supervisor. In his new post Musgrave will assist in handling matters relating to labor unions.

► **Lee J. Thompson,** personnel director for San Diego Gas & Electric Co. since 1951, has retired after 38 years of service with the company.

► **Ernest E. Tugby,** well known southern California electrical engineer and substation engineer for Southern California Edison, died recently after a long illness. He was an active member of AIEE and the Engineers' Club of Los Angeles.

► An electrical man will now manage the Utah Hotel Co. with the appointment of **Leland B. Flint,** Flint Distributing Co., by President McKay of the Mormon Church, which owns the hotel.

Kime

Kime Retires

Elmer E. Kime, vice-president of operations for California-Pacific Utilities Co. and well known for his contribution to the utility industry over 44 years of service, is retiring this month. In making the announcement, President E. K. Albert said that Kime will remain on a part-time basis for consultation and special assignments. He has been on the company's board of directors since July 1953.

Starting his career at McGill, Nev., with predecessors of Kennecott Copper Co., Kime went to Arizona Power Co. in 1921 as superintendent of steam and hydro production. In 1927 he moved to management of Needles Gas & Electric Co. in California and in 1932 became division manager for West Coast Power Co. in Wyoming, Idaho and Nevada. Later he was transferred to Portland as that company's operating manager. He returned to Needles as division manager in 1945 and subsequently was promoted to vice-president and division manager of California-Pacific's eastern Oregon division at Baker. He was transferred to the company's San Francisco general office in 1953.

► **Vic Paul,** who founded Vic Paul Co. in Portland six years ago, died Feb. 6 after a long bout of flu that weakened his heart. Mr. Paul, 57, was born in Syracuse, N. Y. Before he founded his own manufacturers' representative business he was manager-buyer for the electrical department of Northern Wholesale Hardware Co. Mrs. Paul will continue to operate the business.

► **Arty W. Clark,** electrical engineer, has recently been elected secretary of the Utah Engineering Council.

KPF switches

Trouble-free Simplicity

of design, of operation

INSTALL KPF switches more quickly on hot or dead lines, at less cost. Just bore holes in crossarms, mount phase units, connect conductors. No precision requirements, no heavy extra mounting structures, no temperamental complex mechanism to bind, freeze, malfunction or need lubrication.

Rugged, lightweight KPF switches have proved their dependability and economy in half a century of major utility service. Make a test installation on your system—this month.

Fully closed.
Bell crank on crossarm, operated by control rod, will rotate switch blade arm clockwise away from stationary arm holding switch contact clip.

Switch blade arm partially rotated.
Switch blade has separated from clip. Quick-break whisker carries current, prevents arcing.

Switch fully open.
Quick-break has snapped free instantly, preventing arcing. KPF switches operate smoothly despite icing, crossarm warpage; never need lubrication.

KPF
AIR BREAK SWITCHES
Standard for half a century

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P. O. Box 1257W • Stockton, California
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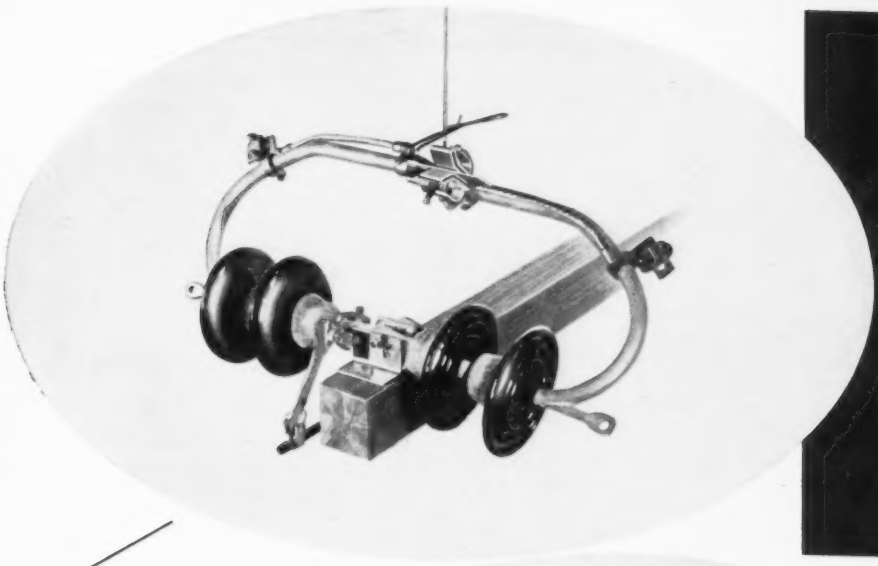

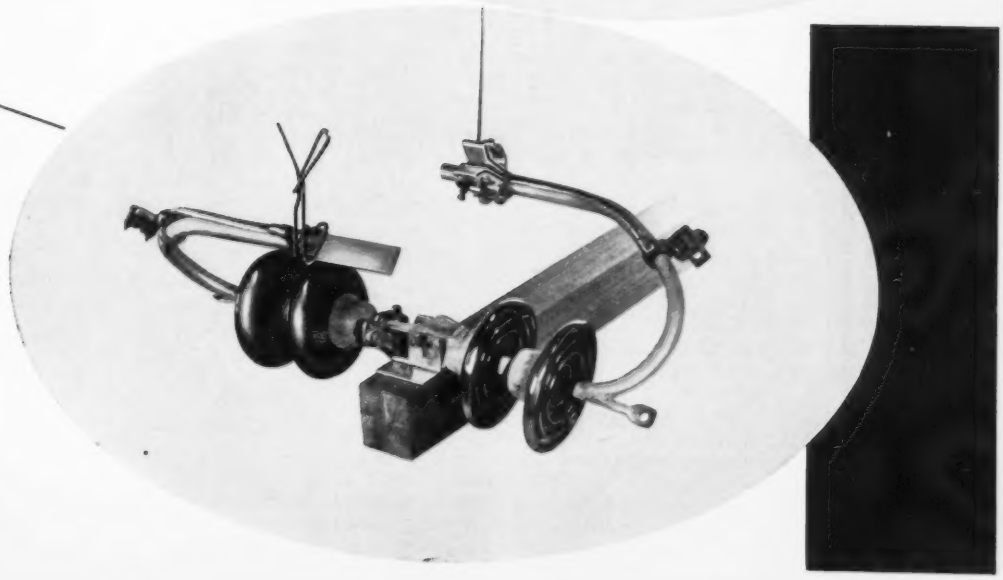

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Fine Fanner Superformed Products

"Superforms* sure fill the bill for a STANDARDS ENGINEER!"

"Fanner Superformed products meet our standards all along the line . . . *technical superiority, accurate manufacture, uniform quality, dependable performance.*"

More and more Standards Engineers . . . *the men who must find BETTER ways to do things BETTER* . . . are testifying that Superforms meet the highest standards. A-1580A

FANNER Superformed with a **"PROTECTIVE TWIST"**

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

Manufacturers—Distributors

We Knew Better!

A similarity of names and a lapse in attention last month combined to embarrass us and confuse our readers. W. R. Nodder (not Notter) is still a partner in the George E. Honn (not Hohn) Co. of San Francisco; has not joined Scott-Buttner Electric Co. of Oakland as stated in our news item. To those who called attention to the error, our thanks, and to the principals our apologies. In the following item, we try again.

► Appointment of **Loren D. Nutter** as manager of Scott-Buttner Electric Co.'s Oakland office was announced by E. L. Buttner, president. Nutter is a graduate electrical engineer and former owner of Golden Gate Electric Co. in San Francisco. He will be responsible for East Bay contracting operations. **E. M. Buttner** will be general manager of the firm's Bay Area activities, including a branch in Mountain View and an office in San Francisco. **J. M. Stroyan** continues as field superintendent and **B. D. Winship** as office manager.

Nutter

► **Power City Electric** in Spokane, owned by E. B. De Feyter, recently moved to a new warehouse, shop and office building, giving it 20,000 sq ft of warehouse and shop space and 3,000 sq ft of office space at E. 202 Trent St. It also has additional rental space. The company has specialized in industrial and pole line construction throughout the Northwest.

► **Management Changes**—**Carl A. Reeb, Kerite's** Western manager, was appointed assistant to the president; **Marshall C. Blevins** was promoted to Western manager and **Dale E. Skyllingstad** becomes assistant Western manager . . . **Chester F. Mitchell** was made engineering consultant to the **RT&E** Corp . . . **D. R. Shoults** has succeeded **Francis K. McCune,** vice-president, engineering services, as representative-atomic development for **G-E** . . . **I-T-E Circuit Breaker** has elected **Harry L. Buck** to the newly created post of executive vice-president . . . **Lee B. Thomas,** founder and board chairman, has been returned to the presidency of **Thomas Industries** following the death of **Frederick Keller** . . . **Gordon Cavanagh** is product manager for Alumoweld, **Copperweld's** new aluminum-covered steel wire and strand . . . **Norge** has made **Judson Sayre** its board chairman and chief executive officer. **Robert H. Quayle** succeeds him as president . . . **G&W** has made **Norman O. Kirkby** general manager; **Robert C. Poetsch,** sales manager.

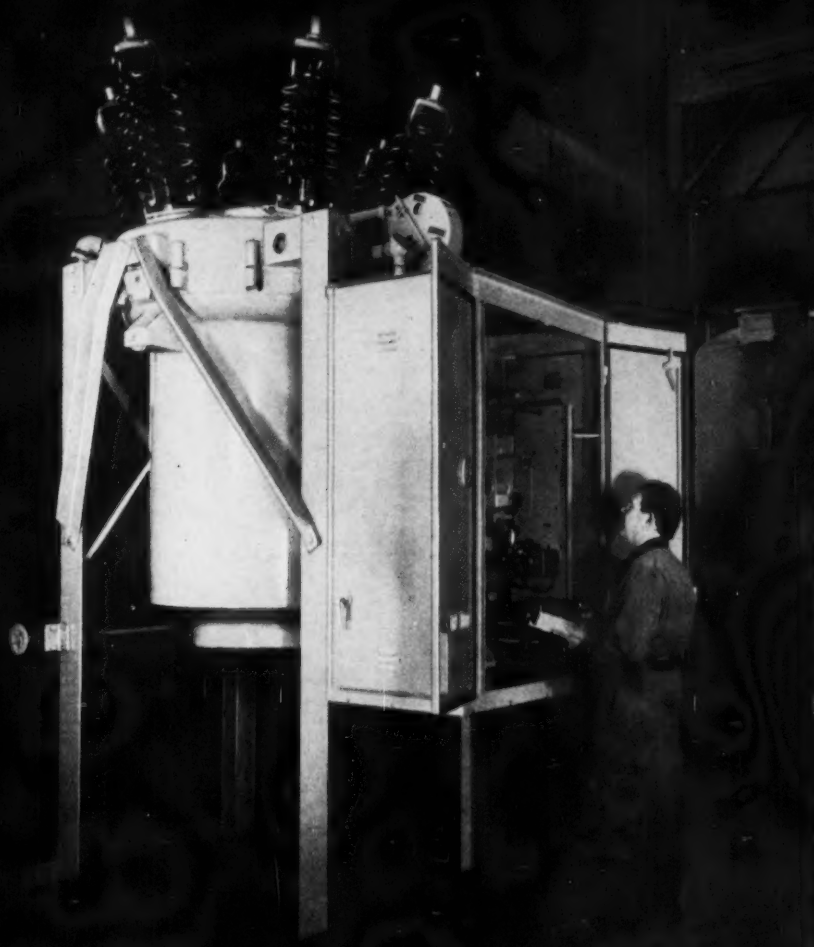
► **John E. Hogg** of Palo Alto, Calif., former Western regional manager for **General Electric** Co. there, has been named manager for marketing administration and personal development for the firm's Phoenix computer department. In the new position, he will be responsible for product delivery, including contracts administration and marketing office management, and for educational and training programs for personnel.

► **Babcock & Wilcox** Co. has established a boiler division district sales office in Denver, it was reported by S. T. Mackenzie, vice-president in charge of sales. The new office takes over steam generating equipment sales and service activities relinquished by the Stearns-Roger Mfg. Co. on termination of its sales agency agreement March 1. **Robert L. Swinney,** sales engineer in Chicago for the past 21 years, will be Denver district sales manager with headquarters at 1806 Tower Bldg., 1700 Broadway, Denver. He will be responsible for sales in Colorado, Montana, New Mexico, Utah, Wyoming and parts of Idaho and Nevada.

Swinney

► **I-T-E Circuit Breaker** Co. will close its San Francisco office on April 1 and move all Bay Area operations to South San Francisco. Robert G. Petersen, Western regional manager, will be located in the South San Francisco office at 230 Ryan Way.

► **Don Congdon** has been appointed a **Wakefield** sales representative at Denver.



- Only One Tank to Lower
- Easy Access to all Internal Parts
- From 30 to 80 Gallons Less Oil
- Saves 20% Maintenance Time

NEW I-T-E TREND-LINE BREAKERS SET THE PACE FOR SUBSTATION ECONOMIES

I-T-E, the foremost U.S. manufacturer of switchgear and power interruption equipment, announces an exciting new line of outdoor power circuit breakers—the I-T-E TREND-LINE. Now, substations may employ single-tank breakers in subtransmission ratings with complete confidence in the reliability and performance.

Incorporating a new KOOL-ARC vertical interrupter, these breakers deliver 5-cycle interrupting time as standard performance. Although all phases are contained within a single steel tank, adequate clearance and special tank liners and phase barriers ensure equal or better protection than that afforded by three-tank designs. The new single tank can be easily dropped by one man using an electric tank lifter. With only one tank to service and maintain, substation economies are realized that were previously impossible with the old three-tank designs.

For descriptive literature on the I-T-E TREND-LINE, write to 1667 North Main Street, Los Angeles 12, Calif., Dept. EWE-960-1.

I-T-E CIRCUIT BREAKER COMPANY
KELMAN POWER CIRCUIT BREAKER DIVISION

Quick...Easy...Sure

STRIP back cable insulation...arrows on INSULINK show how far.

INSERT wire ends; caps grip and hold cable, both hands are free for crimping.

CRIMP with standard compression tool... guide lines on INSULINK show where.

Pre-insulated

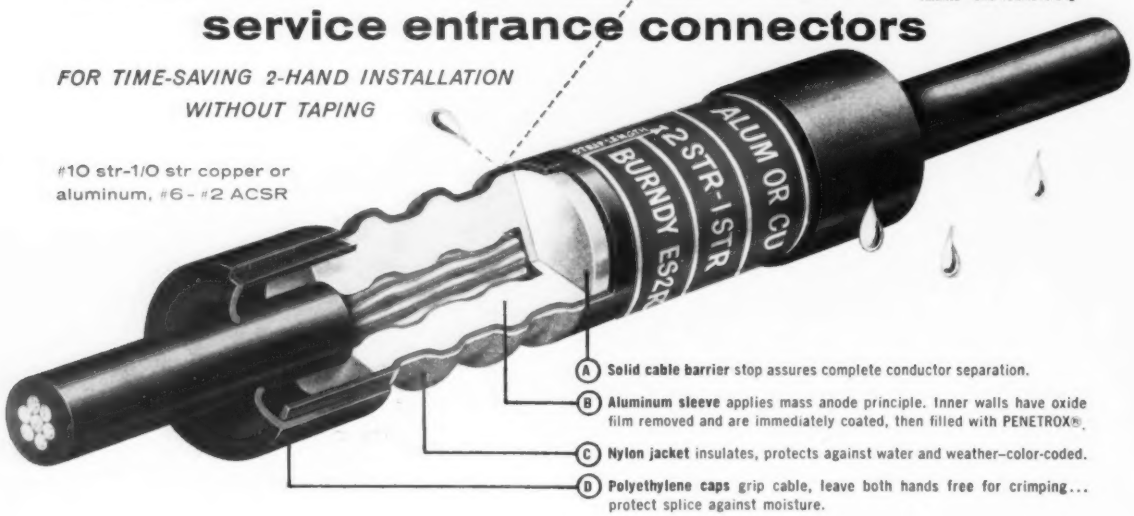
INSULINK®

Patented Other Patents Pending

service entrance connectors

FOR TIME-SAVING 2-HAND INSTALLATION WITHOUT TAPING

#10 str-1/0 str copper or aluminum, #6 - #2 ACSR



(A) **Solid cable barrier** stop assures complete conductor separation.

(B) **Aluminum sleeve** applies mass anode principle. Inner walls have oxide film removed and are immediately coated, then filled with PENETROX®.

(C) **Nylon jacket** insulates, protects against water and weather–color-coded.

(D) **Polyethylene caps** grip cable, leave both hands free for crimping... protect splice against moisture.

Connect service entrances with much less effort, in less time, **without taping.** INSULINK pre-insulated compression connectors are installed in three simple steps with the same crimping tools and dies used to install uninsulated connectors...for time-saving economy...for neat, fully protected, electrically stable connections. INSULINK connections are

QUICK: because there's no taping.

EASY: color-coded connector jacket clearly marked to show cable ranges, strip length, where to crimp. Just strip...insert...crimp; caps hold cable ends in place for simple two-hand installation.

SAFE: fully insulated to protect personnel; protected against water and weather; neat, attractive appearance.

Get the full story on **INSULINK** pre-insulated connectors from

BURNDY

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Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

► **John T. Casey** Jr., formerly regional sales manager for the clock and timer department, has been appointed Western sales manager for **General Electric's automatic blanket and fan department.** His headquarters are at 2804 Beverly Blvd., Los Angeles. He is one of four regional sales managers appointed by the department recently.

► Appointment of **Gavin Embry** as industrial engineer manager for the Pacific Coast Engineering Co. has been announced by W. L. Treadwell, assistant general manager at Alameda, Calif. Embry joined Paceco in 1957. He formerly was with Kaiser Engineers for six years as the manager of organization and procedures.

Embry

► **Electrend's** new external mount WB model was shown with the company's forced air heating systems at the annual conference of supervisory personnel sponsored by Southern California Edison Co., **Hill & Deitrick,** Western distributor, reports. Lloyd Bowles of Edison was host at the week-long event in the Los Angeles Statler-Hilton.

► **A. E. Mackenzie,** vice-president and general manager of **I-T-E's Kelman Division** at Los Angeles, was elected to the newly established post of vice-president — power equipment, and will move to Philadelphia headquarters. He has been with I-T-E since 1944 and in the Los Angeles post since acquisition of Kelman in 1956.

Mackenzie

► **Reece C. Gwillim** is representing **Advance Transformer** in northern California. His address is 1560 Julie Lane, Los Altos.

► **Nicholas Electric** Co. is celebrating its 50th anniversary as an electrical contracting firm in Hollywood. Owned by Howard C. Nicholas and Herbert Evans, the firm has always been an open shop operation, yet both partners have been very active in NECA affairs in Los Angeles.

Shown at their first formal sales meeting are members of Petersen Engineering Co.'s sales and engineering group. At far right is J. T. Isbell, vice-president in charge of sales; next to him President Gerald A. Petersen. The others (seated counterclockwise) are: Robert W. Goode, chief engineer; Ernest L. Miller, assistant to Isbell; Donna M. Birdseye, office manager; Tom E. Sherman, field representative; Fred Altstadt, accountant; John Benetti, drafting engineer; William Troeppl, field representative; David J. Coggin, production department; Paul K. Haggard, PENGO dealer; William J. Lanum, field representative; William C. Gooch, field representative

► **James Freeman** has joined Bull-Dog Electric Products in Los Angeles as a field engineer in the company's distributor operations. He was most recently with C. R. Switchplate Co.

► **Lee T. Bordner,** president, Sierra Electric Corp., Gardena, was elected vice-chairman of the Wiring Device Section of National Electrical Manufacturers Assn. for 1960. The Western manufacturer has long been active in NEMA affairs.

► **David A. Pettigrew,** who has been district sales manager at Salt Lake City for Utah, Idaho and Montana for Sylvania Electric Products Inc., Lighting Products Division, was named sales management supervisor in New York City. **LaMar Winnegar,** formerly of the Deseret Book Co., was appointed field representative in Salt Lake. Another Utahan, **Thomas J. Holland Jr.,** was recently promoted to manager of the Lighting Sales Division of Sylvania in Detroit. He has been division manager in Seattle and was former district manager at Salt Lake City.

► Transformer Division of the **Hevi-Duty Electric** Co. has made two new appointments in the West. **The Clyde P. Elliott** Co., 661 Delaware St., Denver, has been appointed in the Colorado-Wyoming area. **Douglas E. Bolton & Associates,** P.O. Box 79, Sugarhouse Station, Salt Lake City 6, was appointed in the Utah area.

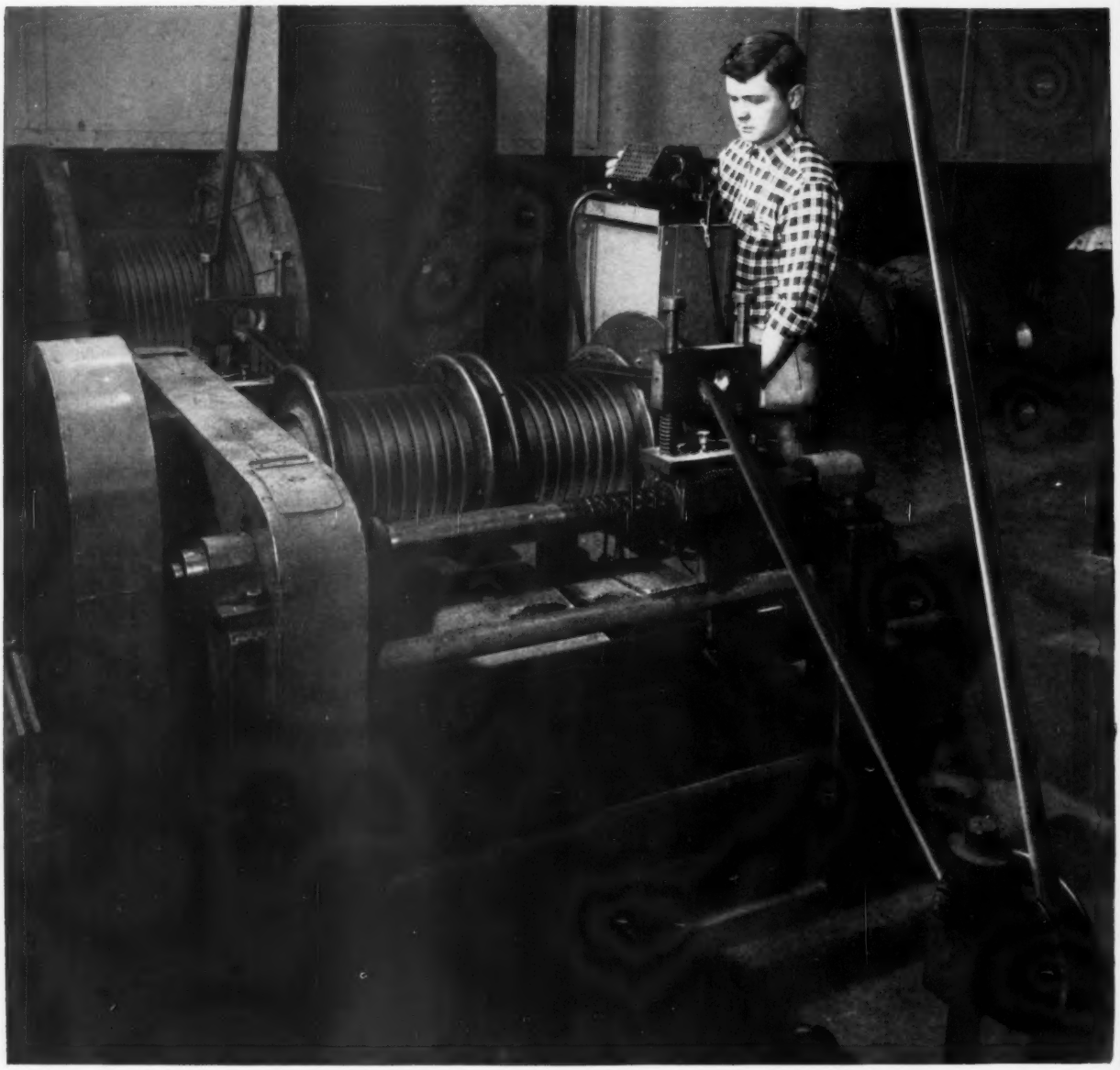
► **Howard Oliphant** was transferred from Seattle to Salt Lake City as district manager of General Electric's sales and distribution department. He replaces Robert R. Strachan, recently promoted to manager, field product service of G-E's sales and distribution department headquarters at Appliance Park in Louisville.

Oliphant

In his new position Oliphant will head up distribution of G-E major appliances, television and stereophonic sets in Utah, Idaho, Montana and parts of Oregon, Nevada and Wyoming. Branch offices under his charge are in Boise, Idaho and Butte, Montana.

► **A. I. "Gus" Nicholson,** appliance manager of Salt Lake branch, Graybar Electric Corp., has been promoted to district manager at Salt Lake City for firm's major appliance and TV sales. The native Salt Laker, who joined Graybar as a warehouseman in 1939, will be responsible for Graybar distribution of these items in northern California, Utah, Idaho and Nevada.

► **Allis-Chalmers** has surrendered patent rights to two methods for testing transformer oil: one for estimating interfacial tension, the other for estimating the neutralization number of an oil.



Accelerated testing of cable. This machine, designed by AS&W engineers, is testing mining machine cable to determine its resistance to reeling and pay off under tension, abrasion, flexing under tension, kinking under tension. Just one of the ways to determine the best insulating and jacketing compounds.

From portable tools to the largest power shovels, Amerclad Cables offer safe dependable service.

It's how you mix ingredients in just the right proportions that makes a big difference in cable performance.

USS **Tiger Brand Electrical Wire & Cable**

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

For phone number of closest representative see advertising index in back of book.

What's the difference in electrical cable?

In USS Tiger Brand Amerclad it's better engineering and quality construction

Engineered for the job. USS Tiger Brand Amerclad Cables are used in such a variety of applications that "engineering for the job" becomes extremely important. Special constructions are designed for electric shovels, dredges, mining machines, welders and portable tools. Cable life depends on how well the engineers have anticipated all the destructive forces that a cable encounters in service.

Quality construction. USS Amerclad's highly flexible construction—rubber insulated conductors and Amerprene jacket—is carefully designed to give you superior electrical performance and mechanical reliability. Dynamically balanced rope lay conductors, as opposed to loosely bunched groups of fine wires, give balanced performance and long, trouble-free service through elimination of unequal tension and elongation.

Each conductor is separately insulated with Amerite, a tough heat-resisting, special rubber compound that exceeds the requirements of ASTM, and other industry standards. A rugged abrasion resisting Amerprene jacket protects the cable from mechanical abuse.

Tiger Brand Amerclad Cables are as tough as they come. They soak up shock and vibration, withstand crushing impact, severe jerking and pulling for unbelievably long periods. Used outdoors for mining, quarrying and excavating machines, Amerclad resists the constant wear and abuse from contact with rocky ground. And installed on lighter indoor equipment—electric welders, shop tools and motor leads—Amerclad gives top performance even when it's dragged over rough floors, through oil, grease or water.

Amerclad's greater durability will pay for itself many times in unfailing service, and ability to handle rated loads. It's the toughest electrical cord and cable money can buy.

Send for catalog. The Tiger Brand Amerclad Cable story is told completely in our new book we've reserved for you. We'll send the book without cost or obligation. American Steel & Wire, Dept. 0197, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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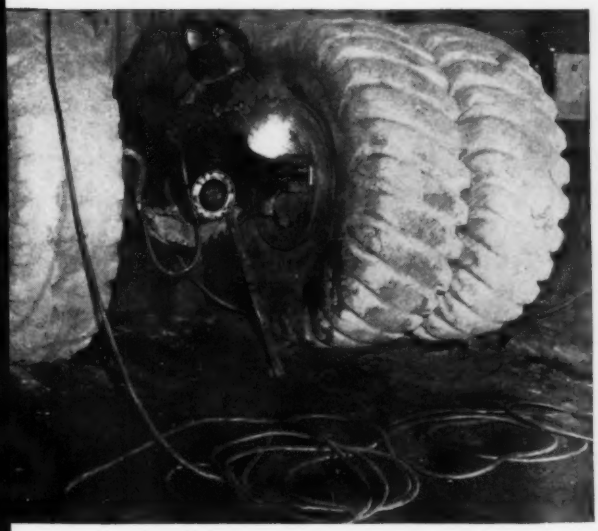


► **Brooks Products** Inc., maker of vaults and boxes for underground distribution systems, is building a new plant at 8907 Railroad Ave. in east Oakland. The project, covering 15,000 sq ft, will include both office and manufacturing facilities. Brooks is headquartered in El Monte, Calif.

► Acquisition of **Bentley-Harris** Mfg. Co., producer of insulation sleevings and tubings, by **Raychem** Corp. of Redwood City, Calif., has been negotiated under a stock transfer plan.

► **George S. Trotter** has been made manager of the Western Sales Region of **General Electric's Large Lamp Department,** replacing **Donald D. Scarff,** who recently was named general manager. Trotter's former post as Cleveland manager will be taken by **Harold E. Bentz,** who has been manager of the department's Puget Sound sales district at Seattle. With responsibility for five sales districts, headquartered in Portland, Oakland, Los Angeles, Seattle and Denver, Trotter will headquarter in Oakland, Calif.

Trotter

► **Clint Pooley,** formerly in **Westinghouse** Electric Corp.'s Sacramento and San Leandro offices, has joined the Portland office as lighting specialist.

► **Cannon Electric** Co., manufacturer of electrical and electronic plugs, has opened a new division in Phoenix. Approximately 200 employees from Los Angeles are being moved to the new location.

► Graybar has named **Allen Searle** as sales manager of the appliance division at Salt Lake City. He succeeds A. I. Nicholson, who was transferred to San Francisco as district appliance sales manager.

► **Pete Conner** has been transferred from Danville, Ill., to San Francisco by Hyster Co. and will be office manager for the retail industrial truck division dealership. He has been with Hyster for seven years and was supervisor of the machine order section at Portland before going to Illinois.

► Pfaff & Kendall has announced appointment of **Matt Cabot** as Hawaii representative, handling its outdoor lighting line. Formerly sales manager for Day-Brite, he is a registered mechanical and electrical engineer. He spent seven years in the Navy and holds the rank of lieutenant commander in the Naval Reserve, where he has been active in research.

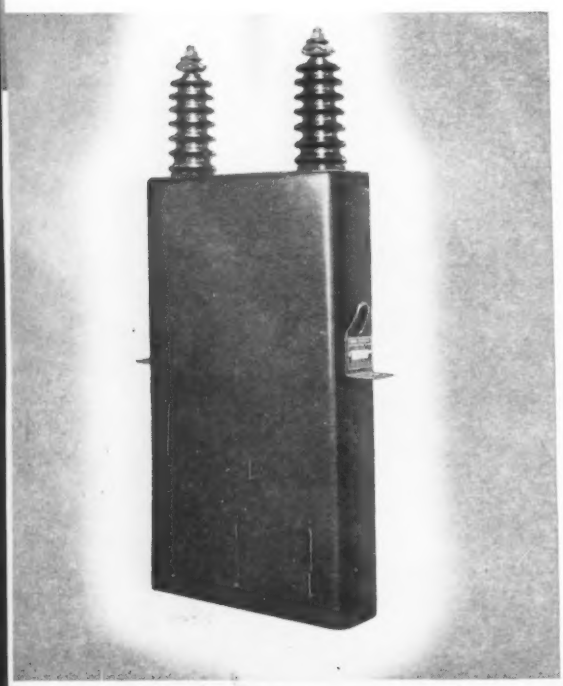
Cabot

► **Pacific Electric Sales** Co., 140 S.E. 28th St., Portland 14, will represent **Reliance Automatic Lighting** Co. in Oregon, Washington and Idaho.

► Pittsburgh Reflector Co. has appointed **Harold Siler** and **John S. Frizzell** as vice-presidents. Siler will direct sales activities and Frizzell, engineering and sales promotion.

► **John Bagoy** is **RT&E's** representative in Alaska. With headquarters in Anchorage, he reports to the Portland plant.

G-E "COMPACT ISOKRAFT* 50" CAPACITORS OFFER



900 KVARS AT

General Electric's new "COMPACT ISOKRAFT 50" capacitor represents the lightest and most compact 50-kvar unit available. And because of these benefits, higher rated, lighter capacitor equipments can be installed in locations where weight and size are limiting factors.

Single-row capacitor equipments offer the cumulative weight reduction of these new, 4-inch-thick, 82-pound, 50-kvar units. They weigh less and, installed, have less extension beyond the pole. Easier, less expensive installation and improved appearance on the pole result.

"COMPACT ISOKRAFT 50" capacitors help make available a 900-kvar single-row equipment that weighs less than the first 600-kvar equipment introduced in 1956. And the 900 kvars fit into an

*Trademark of General Electric Co.

For phone number of closest representative see advertising index in back of book.

► **James F. Fisher** has joined **Shaffer & Nelson** Inc., 139 S. E. Taylor St., Portland, where he is handling the firm's lines of utility products. Fisher was with the industrial sales division of Portland General Electric Co. for 10 years.

► Appointment of **H. W. King,** Western regional sales manager for **Worthington** Corp., as a commercial vice-president has been announced by President Walther H. Feldmann. A graduate of the University of California, King has served as sales representative in Kansas City and Seattle and as San Francisco district sales manager. His headquarters are at 681 Market St., San Francisco.

King

► Planning to diversify into electronic research, **Sunbeam** Corp. will acquire the **John Oster** Mfg. Co. if stockholder approval is received. Oster would be operated as a wholly owned subsidiary, with no change in officers, personnel or facilities.

► **Pacific Union Metal** Co., Los Angeles, will move to a 55,000-sq-ft site elsewhere in the city during July 1960. The firm manufactures street lights and traffic signals.

► **Safety Switchboard** Co., Oakland, Calif., has appointed **Ray Anson** as sales manager. He formerly was with Campbell & George and Square D.

► **Francis K. McCune,** a native of Santa Barbara, and well known for his work in atomic energy, has been appointed vice-president — engineering services for **G-E.**

► New line for **L. M. Baxter** Co., 1238 N. W. Glisan St., Portland, is the **Artolier** outdoor lantern for residential and commercial use. The firm will represent the line in the four Northwest states for Artolier Corp., Garfield, N. J.

► The Government & Industrial Division of **Philco** Corp. has appointed **Western Scientific Contracting Corp.,** Redwood City, Calif., as sales and service representative for its industrial closed-circuit television equipment and systems throughout northern and central California and Nevada.

► **James Hursh** has been named Western regional engineer for **Edwards** Co. He will work from the Western regional office in Los Angeles. Formerly a technical representative, he joined Edwards in 1951. The appointment is part of a new set up establishing field engineering service in four sections of the country. The change was made to speed flow of technical information, according to R. L. Kempton, marketing vice-president.

Hursh

► **Elder Heinle** has been appointed co-manager of the Sacramento-San Joaquin Valley branch of Ets-Hokin & Galvan, San Francisco.

► Leach Corp., Inet Division, Compton, Calif., has appointed three project engineers—**Robert N. Carson, A. Richard Hammer, Paul Pazurek. Robert D. Hallock,** manager of the division, said that the appointments were a part of a major expansion program.

600-KVAR WEIGHT

equipment that extends only 5 inches more beyond the pole than a 600-kvar equipment with superseded 50-kvar units.

And further reducing costs, self-protecting aluminum racks and corrosion-resistant stainless-steel capacitor cases eliminate the need for periodic protective paint maintenance.

For more complete information contact your General Electric Apparatus Sales Representative, or write for Bulletin GEA-7061, General Electric Co., Section 445-32, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

PRODUCT NEWS

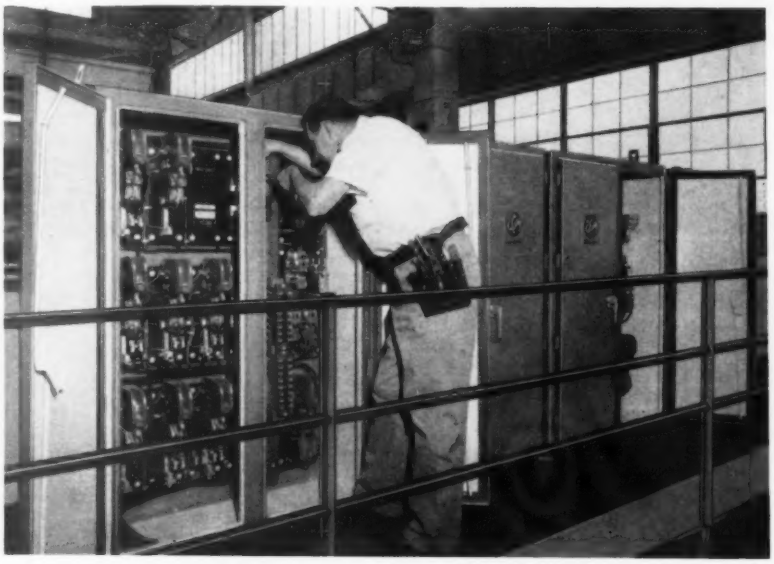
New Designs and Applications

Mobiles

(1) *General Electric Co., Schenectady 5, N. Y.*

A new design for mobile substations and transformers claimed to give more kva per pound on the road has been announced by G-E's Power Transformer Department. According to the manufacturer, thorough study of mobile equipment components has resulted in significant weight reductions that now permit delivery of mobile substations rated as high as 20,000 kva, 115 kv. Mobile transformers can be obtained with ratings up to 40,000 kva, 138 kv.

Units are designed to meet the highway dimensional limitations of practically every state in the nation. Weights of nearly all the mobile substations and many of the mobile transformers will also meet the restrictions imposed by most states. Special permits can usually be obtained in cases where units exceed the permissible weight, the manufacturer states.



(3) Front-connected controllers eliminate need for back aisle space on crane walkways introduced by Square D's EC&M Division. All wiring and control components are accessible from the front, and there is ample working space inside the cabinet. According to the manufacturer, the new controllers can save up to 20 in. of catwalk width and are 10 to 15% lighter than equivalent controllers with conventional wiring. They come with two, three or four decks to suit headroom requirements and are available for single motor d-c drives up to 225 hp. Details are in Bulletin 6121 from Square D Co., 4335 Valley Blvd., Los Angeles 32, Calif.

Precharged Remote Air Conditioner

(2) *Central Residential & Commercial Air Conditioning Department, Fedders Corp., 58-01 Grand Ave., Maspeth 78, N. Y.*

A low-cost factory charged remote air conditioner, with an outdoor section that can be installed through a wall, is included in the Fedders line. The 2-hp Flex-Hermetic model that is completely charged and tested at the factory features an 18-ft length of flexible armor-covered tubing, permitting the evaporator coil to be installed as much as 18 ft from the compressor section.

Primary advantage of the 22,000-Btu unit is ease of installation, the manufacturer states. Since it is charged at the factory, the installation entails little more effort than would be required for a regular through-the-wall air conditioner, it is stated. With the Flex-Fit frame, the outdoor section can be installed through the foundation; under the eaves and through the studding in a slab home; or through a brick wall.

Bushing Reduces Radio Noise

(4) *Kuhlman Electric Co., P.O. Box 288, Birmingham, Mich.*

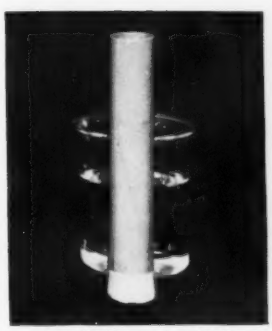
A new bushing is said to offer positive means of reducing radio noise and interference without oil. According to the manufacturer's announcement, a stress-relieving ground sleeve, usually found only on power transformer bushings, encases the bushing shank. The sleeve's greater surface eliminates the concentration of stresses that could cause radio noise, it is reported.

Other features are a full-protection hand grip, allowing line connections without need for tools; new design and construction of porcelain with heavier, stronger skirts; spring loaded terminal accommodating a wider range of aluminum and copper conductors; and new internal clamping that eliminates all external hardware. A new disconnect permits disconnection of the bushing without tools.

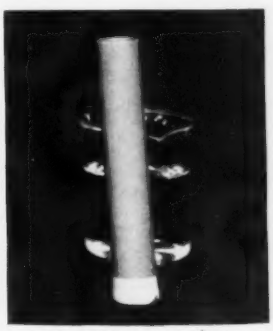
new SILVER-GRAY DUALCOTE RIGID STEEL CONDUIT

by Walker Brothers

The best-looking heavy wall conduit . . . and it outperforms all others!



Over 1600 hours in sulfuric acid with no breakdown



Over 1600 hours in alkali with no breakdown

Improved alkali resistance. Samples tested in sodium hydroxide for more than three months show no sign of chemical attack!

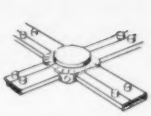
Improved resistance to acid and salt spray . . . even better than in our previous conduit!

Lower coefficient of friction to make wire-pulling even easier!

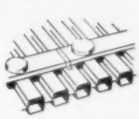
The new silver-gray epoxy finish, applied by special equipment over a sherardized zinc undercoat, easily withstands more heat than can the insulation on conductors inside the conduit.

WALKER BROTHERS, Conshohocken, Pa.

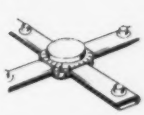
walker of Conshohocken



Walkerduct

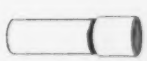


Headerduct



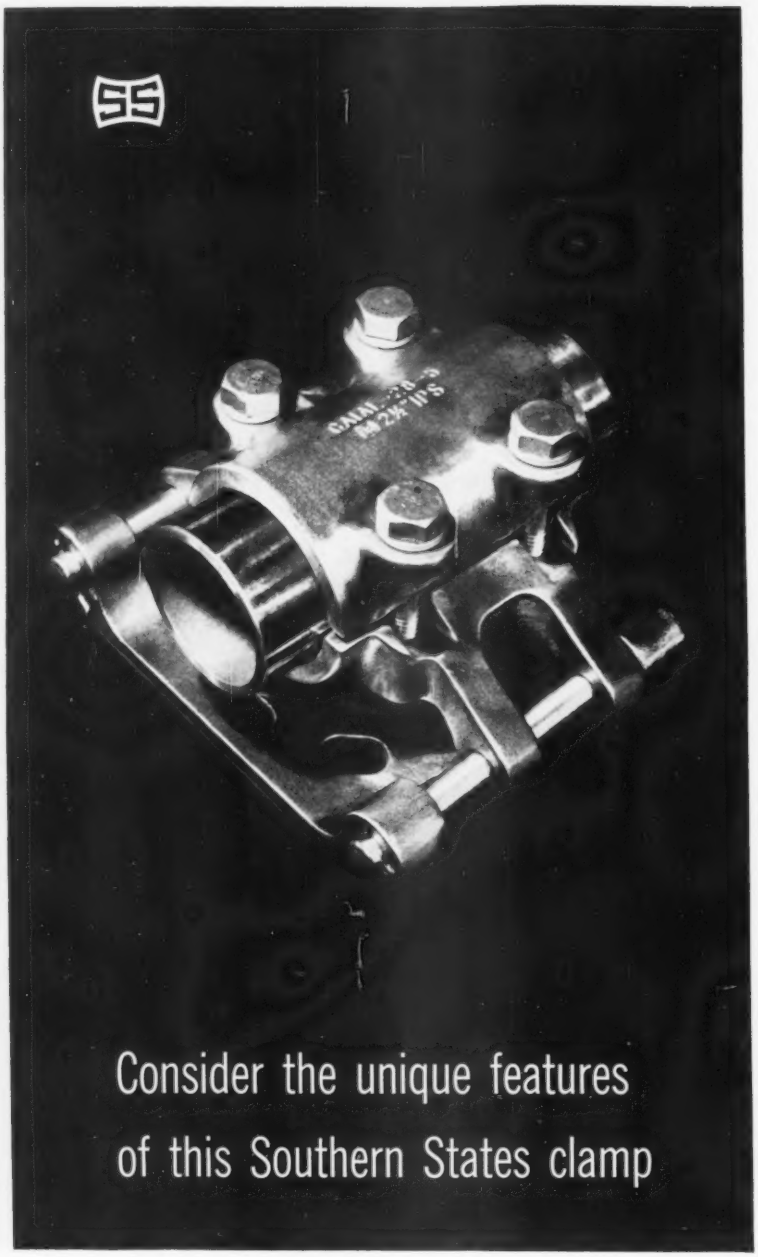
Power Duct

Wire and Cable



EMT and Conduit

Represented by GARNETT YOUNG & COMPANY **Arizona:** 1400 N. 32nd Street, Phoenix. **So. California and So. Nevada:** 3775 S. Broadway, Los Angeles 7. **No. California, No. Nevada & Hawaii:** 390 4th Street, San Francisco 7. **Oregon:** 1238 N. W. Glisan Street, Portland 9. **Alaska & Washington:** 1928 First Avenue South, Seattle 4.



This exclusive design offers many advantages in a sliding bus support clamp: two stainless steel excursion rods . . . wide support to provide high cantilever strength . . . movement in only one direction — no pivoting or side chatter . . . heat-treated, high strength aluminum . . . anodized bolts. The Type CAIAL is another example of Southern States engineering.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

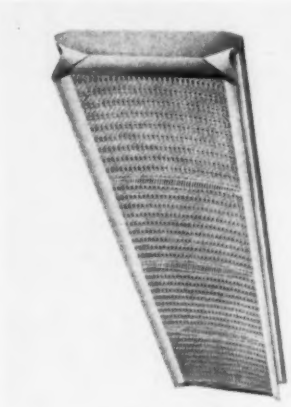
IN CANADA Dominion Cutout Co., Ltd., Toronto

Fuses Certified

(5) *Economy Fuse Division, Federal Pacific Electric Co., 2717 N. Greenview Ave., Chicago 14, Ill.*

ECON dual-element cartridge fuses have been certified to interrupt 100,000-rms amp in all ratings—30-600 amp, 250 and 600 v. The tests, completed under supervision of ETL, show:

1. Interrupting capacity in excess of 100,000 amp is indicated in all ratings in both 250- and 600-v sizes.
2. Short-circuit clearing time of ECON fuses is exceedingly fast, less than one-fourth cycle in all but the largest sizes.
3. The fuses of lower ratings have a high degree of current-limiting ability.



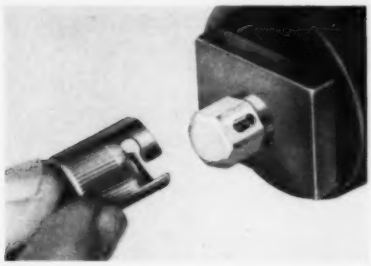
Fixture

(6) *Sunbeam Lighting Co., 777 E. 14th Place, Los Angeles 21, Calif.*

A new item in the Sculpturama series combines that design with the Holophane Prismalume acrylic lens panel to give all-curved styling to commercial interiors. Prismalume is a single, inwardly curved 1x4-ft (nominal) acrylic lens panel with reinforcing prismatic crosswise ribs. Excellent low brightness control is claimed both from the illuminated metal sides and the prismatically sharp Prismalume. The new unit is extremely shallow, is surface mounted with no visible hardware, has lifelong resistance to discoloration, the manufacturer states.

(7) **New Method** — Chance anchors are now available to customers in color-coded cartons and can be shipped on expendable pallets. This new method will greatly facilitate

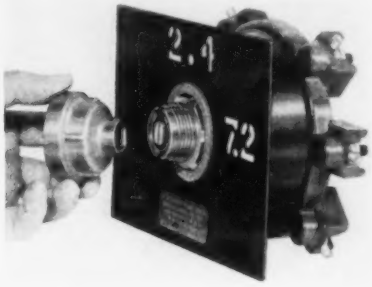
loading, unloading and storage for utilities by permitting the use of mechanized material-handling equipment, the manufacturer states. Expanding and plate anchors are also available in bulk in wire-bound pallet crates for outside storage. A. B. Chance Co., Centralia, Mo.



Disconnect

(8) *Kuhlman Electric Co., P.O. Box 288, Birmingham, Mich.*

A feature of the manufacturer's 1960 pole-type transformers, new disconnects are designed for ease and speed in making or breaking connections for cover removal or fuse replacement. The new disconnects are bayonet-type, seated by a slight turn to the right. A turn to the left releases the device. Positive contact is assured by spring loading the contact surface. The lock pins on the male element of the connector are guided into place by channels on joining cup.



External Switch

(9) *R T & E Corp., 1900 E. North St., Waukesha, Wis.*

A redesigned external switch is available on all dual-voltage transformers manufactured by R T & E. The switch body is a new application of a specialized glass reinforced filled polyester thermoset material. Characteristics claimed by the manufacturer are (1) nontrack, (2) arc extinguishing, (3) inert to the aging effects of oil and thermo-cycling, (4) highly resistant to abuse and shock.

Save up to 70%
of wire-pulling costs

...with the safe, speedy **JET LINE METHOD***

Hundreds of contractors are saving HOURS in wire-pulling time, using the Jet Line Method! A Jet Line Cylinder or Jet Line Gun puts a line through a conduit faster than a man can uncap pipe . . . saves up to $40 per day or 70% of wire-pulling costs!

No fish tape, no snaking . . . simply jet-propel a nylon line through the conduit with the Cylinder or Gun. Pull Jet Line Poly Rope through, then wire . . . the job is completed in minutes instead of hours! The Method works regardless of ells, bends, ups, or loose obstructions. Safe too, because Jet Line uses no explosives, and both the nylon line and the poly rope are non-conductors.

Use the Jet Line Cylinder for ½", ¾", and 1" conduit; use the Jet Line Gun for conduit 1" and larger. In any case, the Jet Line Method does the job better, quicker, safer, and for less cost!

OWN THE COMPLETE JET LINE METHOD

Jet Line Cylinder—for ½", ¾" and 1" conduit. Propels a nylon line "package" through the conduit by means of pressure-expansion of safe, non-explosive Jet Line Gas. New Portable Refill Unit recharges Cylinder at the job!

Jet Line Gun—for conduit 1" and larger. Launches a self-propelled cartridge which travels the length of the conduit, pulling nylon line through behind it. No powder, no explosion—safe!

Jet Line Poly Rope—attach one end to the nylon line, the other end to wire. Pull the line, pull the rope, and you pull wire! Non-conductor, slides easily, cannot damage conduit.

Forget fish tape forever . . . save time, money, and wire with the Jet Line Method.

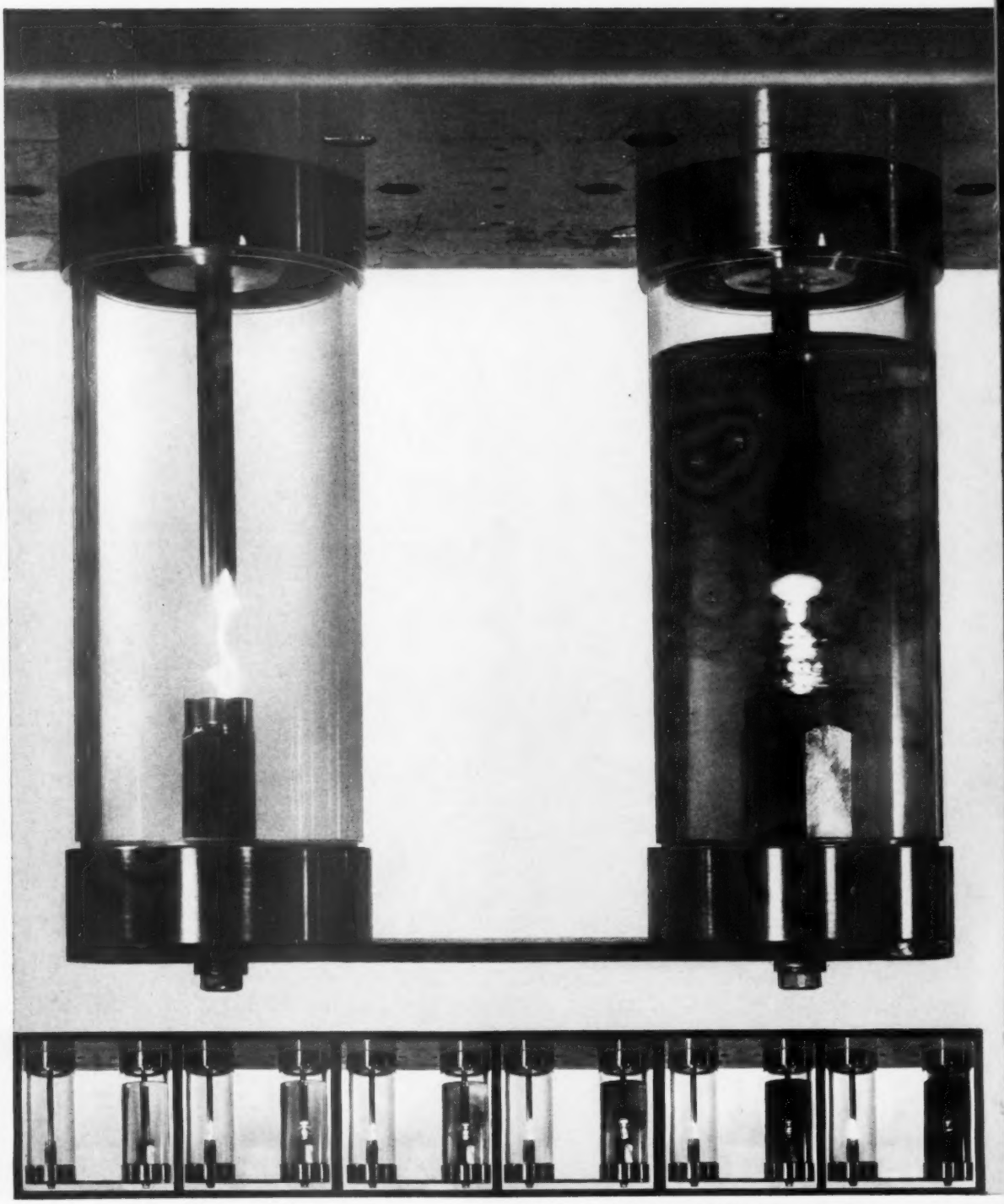
*Pat. # 2,930,584

Ask your distributor for details, or write

4703

JET LINE PRODUCTS INC.

615 FUGATE AVENUE, CHARLOTTE 5, NORTH CAROLINA



THIS SIMPLE TEST PROVES SF_6 (LEFT) REMAINS UNCONTAMINATED AFTER REPEATED INTERRUPTIONS...WHILE OIL (RIGHT) SHOWS EVIDENCE OF CARBONIZATION

In this demonstration, SF_6 gas has quenched a series of arcs with negligible decomposition, as proved by mass spectrographic analysis of the material before and after the test. The oil, after the same number of interruptions, has carbonized and blackened showing obvious signs of deterioration. This means that the intervals between maintenance operations on a breaker using sulfur hexafluoride gas can be greatly increased.

SF_6 gas stability cuts breaker maintenance

Makes possible greatly improved performance from 34.5 kv to 460 kv and beyond

High stability of SF_6 gas as an arc-extinguishing medium will bring you economies in the operation and maintenance of power breakers never before possible. New Westinghouse SF_6 breakers combine many of the recognized advantages of both oil and air breakers, and in some respects are superior to either.

The great stability of SF_6 (sulfur hexafluoride) assures long life of the gas as both an arc-quenching and an insulating medium, even with repeated interruptions. SF_6 has extremely high dielectric strength, recovers full dielectric properties rapidly . . . assures unexcelled arc extinction time after time. SF_6 is inert, nontoxic, nonflammable, odorless . . . entirely safe. These qualities, plus the quiet operation of the closed SF_6 gas system, make SF_6 breakers ideal for all substations . . . even in urban locations where noise may be a problem. New Westinghouse SF_6 breakers are easier and less expensive to install and to maintain than any power breaker available today.

Westinghouse power circuit breakers using SF_6 gas are basically new. But they have proved themselves at several voltages and also promise the most practical design avenue in capacities of 460 kv and beyond.

Westinghouse suggests you buy two of these new breakers in widely separated ratings and apply them in entirely different operating situations. Prove to yourself that they will give you combined performance and economy you cannot get in any other breaker.

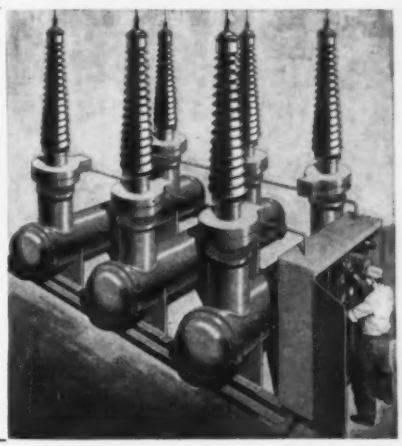
Call your Westinghouse representative today. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60981

PROVE THE OUTSTANDING PERFORMANCE OF THIS BREAKER ON YOUR OWN SYSTEM

The principle of circuit breaker design using SF_6 gas has already been proved successful on several operating systems. Breakers from 46 kv to 115 kv have now completed over two years of service.

With SF_6 breakers you get: FAST INTERRUPTION; EASY INSTALLATION; SIMPLE, LIGHT FOUNDATIONS . . . no ground shock during interruption . . . elimination of oil and size reduction cuts weight up to 65% at 230 kv; DRASTICALLY SLASHED MAINTENANCE . . . SF_6 does not decompose . . . interrupter easily removed; COMPLETE SAFETY AT ALL TIMES . . . dead tank construction; QUIET OPERATION . . . no discharge to atmosphere . . . closed system conserves gas.



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Keeping line clearance costs DOWN goodwill UP

Proven power equipment and Davey trained rope climbers . . . that's what makes Davey Surgical Line Clearance so economical. Utilities can rely on the dependable, efficient, and *adaptable* Davey crew. It will pay you to talk over your tree maintenance problems with the West's leading line clearing specialists—Call Davey.

DAVEY
TREE SURGERY CO., LTD.
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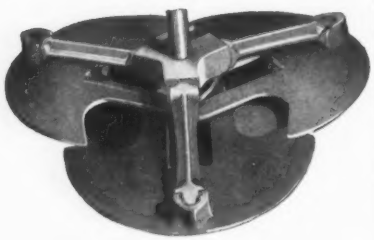
SAN FRANCISCO • Russ Building
LOS ANGELES • Story Building

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



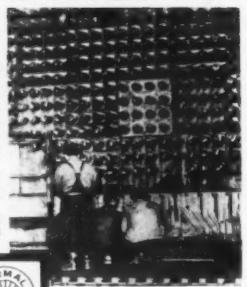
EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

where*
can you get **NEW**
PERMALI"N"

LAMINATED PLASTIC FOR NEUTRON SHIELDING



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Engineering Assistance • Immediate Delivery

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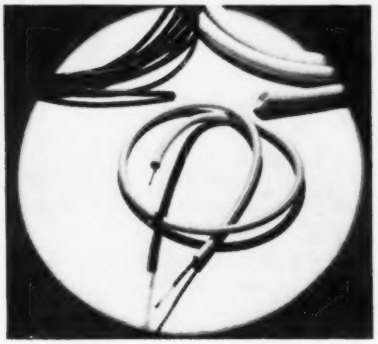
DENVER—2811 W. 9th Ave., CHerry 4-4267

SEND FOR 32 PAGE CATALOG

Insulating Varnish

(10) *Westinghouse Electric Corp., Benolite Plant, Manor, Pa.*

A new grade of clear insulating varnish that meets all requirements for class F applications for coils and wound electrical apparatus is available from Westinghouse, Micarta Division. The modified polyester resin-base material withstands temperatures up to 155 C and can be used with any commercially available class F magnet wire, the announcement states. Cost of the new varnish is about that for varnishes for class A applications.



Tubing

(11) *L. Frank Markel & Sons, Norristown, Pa.*

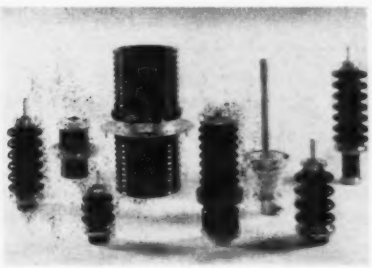
Flexite SR silicone rubber extruded tubing exhibits outstanding flexibility, retaining elasticity after long exposure to temperatures from —85 C to 225 C, the manufacturer claims. Its tensile strength, elongation and tear strength are excellent, as is its resistance to corona, oils and weathering, it is stated. Flexite SR withstands short-term temperatures to 315 C, and is rated for continuous use at 200 C. Samples and data on request.

Control Mount

(12) *Fisher-Pierce Co., 47 Pearl St., South Braintree 85, Mass.*

A new cast aluminum mounting bracket and adapter is offered by this company to simplify installation of twistlock photoelectric controls on street lighting poles or crossarms. The L-shaped bracket is attached to the pole or crossarm by the use of two ¼-in. lag screws. The adapter is then placed on the bracket and rotated until the direction marker faces between northwest and northeast.

(13) This steel switch house, one of 19 specially built by Delta-Star Division, H. K. Porter Co., was designed to be portable, attractive and safe. The slanting roof is compact and prevents accumulation of rain or snow. A three-phase disconnect switch with Powerupters is rated 600 amp at 34.5 kv. Provision was made for potential transformer, lightning arrester, three incoming lines and three load side bushings. With switch installation the house weighs some 4,000 lb. Details from the manufacturer, 2437 Fulton St., Chicago 12



Solder-Seal Bushings

(14) *Lapp Insulator Co. Inc., Le Roy, N. Y.*

These solder-seal bushings are designed for low-voltage applications on hermetically sealed capacitors, test transformers and similar types of electrical equipment. It is claimed that they are completely leak-proof with high mechanical and dielectric strength and that they can be designed in a choice of shapes, sizes and ratings to fit a wide range of applications.

Bushings consist of a porcelain unit with a thin fired-on metal coating to which metal caps, flanges, rings, etc., can be attached by soft solder techniques. They can be made to customer's design and specifications or can be designed and made by the manufacturer to meet specified characteristics. They are supplied completely assembled and tested, ready for installation.

Transformer Equipment

(15) *Moloney Electric Co., St. Louis 20, Mo.*

Designed for use by utilities planning underground residential distribution systems, the Unitran consists of a transformer, low voltage compartment and a high voltage compartment designed to couple with each other in a single compact unit.

Compartments are fabricated of heavy gage sheet steel and have ample space for connections and entrance of cables, the manufacturer states. Full width, weatherproof, tamperproof doors are provided on both compartments.

The HV compartment has provisions for mounting lightning arresters and potheads. In addition, it may contain a fused disconnect-sectionalizing switch for loop feeder service.

This switch can be operated under load without an external arc by using a commercially available load break tool. Thus, the switch provides a means for sectionalizing a portion of the loop feeder and the fuse provides for transformer protection and isolation.

A second development announced by Moloney is a safe, attractive enclosure for utilities desiring to use conventional pole-type transformers for underground residential service. This enclosure is constructed of heavy gage sheet steel and is equipped with doors on each end for ease of maintenance and installation, the manufacturer states.

The Unitran is available in voltages 15-kv Grd. Y and below, in conventional transformers 15 through 167 kva, or in CSP units 15 through 50 kva. The enclosure is suitable for use with comparable ratings of pole-type units.

F Fixture

(16) *Crouse-Hinds Co., Syracuse 1, N. Y.*

A weatherproof, fluorescent fixture (type HLG), especially designed for outdoor installation, has many indoor applications as well, according to the manufacturer, who suggests such uses as lighting indoor swimming pools from the ceiling.

The fixture is sturdily constructed and has a shatterproof plastic lens, the announcement states.

Earl S. Condon
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Here's why you get superior performance FROM FURNAS CONTROLS

. . . Furnas Magnetic Starters feature advanced design for superior performance and longer life. Standardized design reduces parts inventory and provides quick and easy field modification.

- Dual Voltage 110-220 or 220-440 Volt Coils reconnectable on the job. Magnet features just one moving part.
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- Trip-free Thermal Overload Relays—manual or automatic reset. Third overload relay kit can be added in the field.
- Extra Switchlet interlocks for additional pilot circuits (up to 4) may be added to all starter sizes 0-4.

Contactor

Drum Control

Write today for FREE Color Bulletin 14-B1, Furnas Electric Company, 1082 McKee St., Batavia, Illinois A76

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS

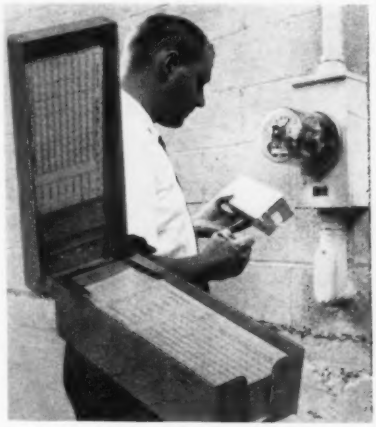
Wiring Devices

(17) *Chem Marine Department, Harvey Hubbell Inc., State St. and Bostwick Ave., Bridgeport 2, Conn.*

The "Chem Marine" line was designed to resist corrosion, oils, greases and most acids. Caps and connectors are offered with protective "Seal-Tite" rubber covers, which can be used with receptacles in combination with lift cover plates. The three-wire, 15-amp, 125-v grounding devices are included for use with portable electrical tools and equipment. A three-wire cap and connector body and a duplex receptacle make up the grounding line.

A combination unit—a weatherproof "Insulprene" plate and "Presswitch"—offered in the line is said to answer the need for an outdoor switch that is operative while completely enclosed. The flush-mounted Insulprene plate is a weatherproof covering that fits both FS and standard boxes. The Presswitch is a press-type a-c switch.

(18) **Busway** designed exclusively for electric utility excitation systems can be economically used instead of conduit and cable for a variety of exciter-to-generator systems, according to the manufacturer. Four types of construction—indoor or outdoor ventilated, indoor or outdoor totally enclosed—can be supplied with either copper or aluminum conductors in ratings up to 4,000 amp at 500 v d-c. Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.



(19) METER READING CASE—As an aid to utilities using punched cards for customer billing, Wright Line Inc. of Worcester, Mass., has introduced a case that holds 300 or more cards arranged in order of reading. The reader writes the meter figures on the card with a special sensing pencil, then inserts it at bottom of case.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after June 1

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*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

BULLETINS ETC.

(20) **ALUMINUM CONDUCTORS**—Technical information on resistance and reactance of aluminum conductors for overhead transmission lines is available in a 90-page publication from the Rome Cable Division of Aluminum Co. of America. Latest research findings, including information hitherto unavailable, are incorporated in "Resistance and Reactance of Aluminum Conductors." The new report comprises Section 5 of Alcoa's long-range technical research publication project for the utility field, titled Alcoa Aluminum Overhead Conductor Engineering Data. Available for the first time are revised data representing results of recent cooperative research programs carried out at Illinois Institute of Technology and Alcoa Research Laboratories. May be secured from any of Alcoa's Rome Division offices or on request from 723 Alcoa Bldg., Pittsburgh 19, Pa.

(21) **CATALOG** — I-T-E's 1960 Speedfax Catalog gives information on the manufacturer's standard and engineered products. The 60-page catalog is divided into three sections: molded case circuit breakers; individually enclosed low-voltage power circuit breakers; engineered products. A new two-page layout in the Tranfo-Unit portion provides outline sketches and listings of components and ratings for 16 types of Tranfo combinations. Copies of the catalog may be secured through the local distributor or district office or by writing to I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30.

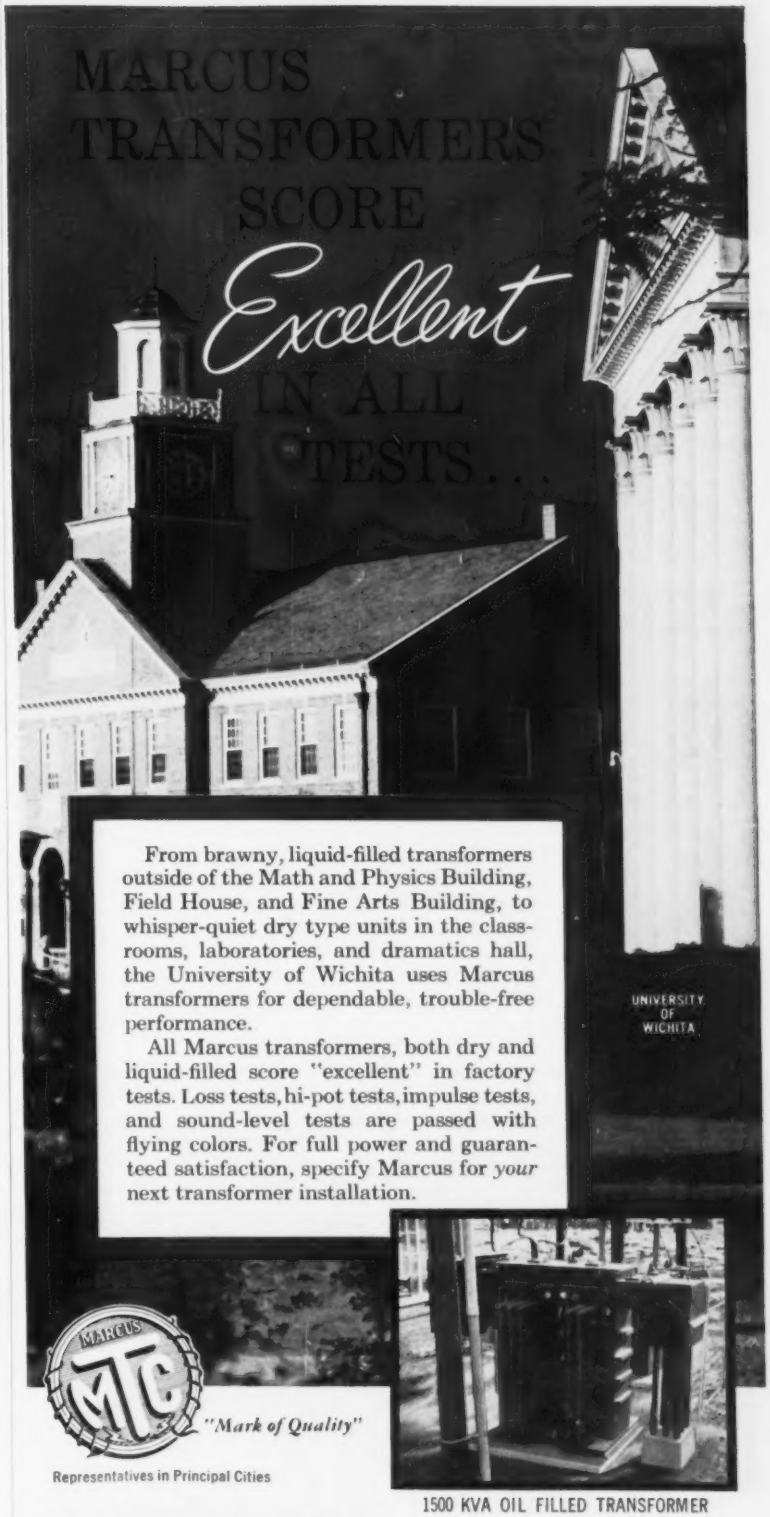
(22) **CATALOG** — A 155-page catalog has been issued by Federal Pacific Electric Co. This ready reference bulletin is indexed on the cover and has a supplementary numerical index in the back. Available from FPE at 50 Paris St., Newark 1, N.J.

(23) **FITTINGS** — Steel City Electric Co. has issued a new catalog-handbook on its Kindorf line of channel, fittings, hangers and supports. It is available from the company at 1207 Columbus Ave., Pittsburgh 22.

(24) **FUSE CUTOUTS**—Bulletin FC3, available from Line Material, describes type LMO open fuse cutouts. Rated 100 amp at 7.8, 15 and 27 kv, these cutouts have maximum interrupting capacities of 20,000, 16,000 and 6,000 amp, respectively. Write Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

(25) **ELECTRIC FURNACE** — Advantages of its new compact electric furnace are told by Ramco Mfg. & Engineering Co. in a recent bulletin. Designed specifically for mobile homes, the new furnace is also suitable for heating small houses (800 sq ft). It is 30 in. high, 15 in. wide, 21 in. deep; heats by the aluminum fin tube principle. Copies of the bulletin are available from the manufacturer at 5413 N.E. Columbia Blvd., Portland 18.

(26) **COATINGS**—Recent data sheets available from Subox, Fairmount Plant, Hackensack, N.J.: "Capox catalyzed epoxy resin coatings combat corrosion"; "Aerox, a product for airway markings"; "Surfa-Prep No. 100 pretreats and primes galvanizing in one operation"; "Galvanox-Type II, chemically resistant zinc coating."



From brawny, liquid-filled transformers outside of the Math and Physics Building, Field House, and Fine Arts Building, to whisper-quiet dry type units in the classrooms, laboratories, and dramatics hall, the University of Wichita uses Marcus transformers for dependable, trouble-free performance.

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1500 KVA OIL FILLED TRANSFORMER

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A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

SAVE up to 35% on installations with single pole mounted TECO Air Break Switches

If you use conventional air break switches that require 2 or more poles—you can save up to 35% on your present labor, material and space costs with TECO air break switches mounted on a single pole. Additional savings in line crew time are made possible with pole band mounting.

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New TECO compact design makes possible secure single pole mounting. How compact? On the 69 KV model, distance from blade to pole is less than 36"—on the 115 KV, less than 48".

Not top heavy. Lighter, more compact TECO air break switches stay on single poles in high winds because their weight is evenly distributed-there's no "top heaviness". No side guying necessary.

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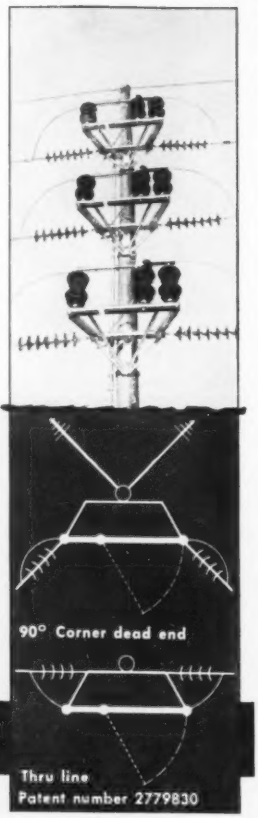
Available switch sizes are—15 KV thru 161 KV at 600 and 1200 amps.



For more information write TODAY for bulletin 601.

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Complete line of air-break switches, dead-end band brackets, flexi-band and thru-bolt cluster transformer brackets.

LETTERS TO THE EDITOR

Ciphers Missed

To the Editor:

There is a glaring error in your March issue.

Under "financial notes" on page 10 you report on our application to the Federal Power Commission for authority to issue promissory notes in an amount not to exceed $10,000,000. Then the story says that the FPC had previously authorized the company to issue promissory notes limiting the outstanding aggregate amount to $40,000. This latter amount, of course, should have been $40,000,000.

We are naturally disturbed by this error because there is a vast difference between the printed figure and the correct figure. If your readers take the printed figure as accurate, the resulting impression would be a disservice to this company.

R. F. Ball
Vice President
Idaho Power Co.
Boise, Idaho

Wrong Title

To the Editor:

May I call to your attention report on p 89 of the March 1960 issue of ELECTRICAL WEST, which is somewhat in error.

It is correct that I was elected secretary-treasurer for the Ninth District Council, NECA. I was subsequenly retained as public relations consultant (not legislative representative) for the Ninth District Council, NECA. In the capacity of public relations consultant, I shall advise, counsel and represent the council in the matter of its public relations for the purpose of bettering the electrical contracting industry, so that it may most effectively serve in the public interest.

We greatly appreciate the constructive interest ELECTRICAL WEST has always taken in the activities of our association and shall be very glad to keep you informed as to matters of public interest affecting our industry.

Ernest G. Kramm
Public Relations Representative
Ninth District Council, NECA
Oakland, Calif.

For Sale

3 - 200 KVA Transformers, 66000-2400/4160 volts. For further details write the City Manager, Prescott, Arizona. Bid opening, April 22, 1960.

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Utility Salesman—Excellent opportunity with rapidly expanding Factory Representatives. Must have good contacts as well as knowledge of electrical products. All communications strictly confidential.

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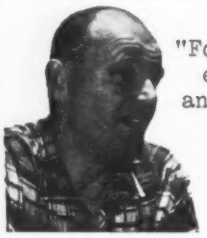

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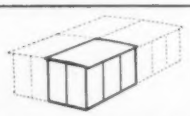

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By nationally known manufacturer of High Voltage switchgear equipment to operate sales office Portland, Ore., selling Northwest area utilities and industrials. Base salary range $8,000-$10,000 plus sales incentive plan. Write with resume to Box 311, Electrical West, 68 Post St., San Francisco 4, Calif.

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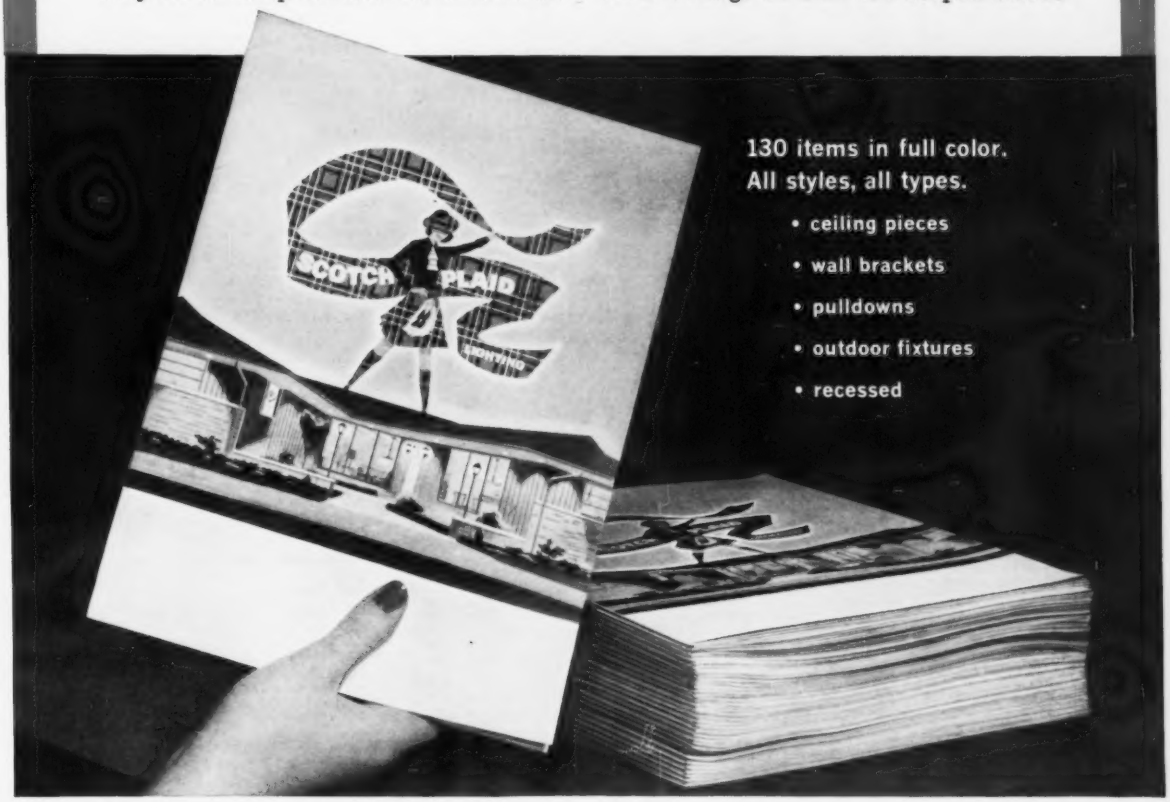
Beauty *PLUS* Economy...

From Virden, famous for quality, comes a new and separate line of lighting fixtures. Called Scotch Plaid Lighting, here is beauty in design, excellence in workmanship, at a truly economical price! Ideal for tract homes or low-cost housing. Excellent for remodeling, wherever you want high-style at budget prices. See the new Scotch Plaid Lighting line at your nearby Virden distributor. Ask him for your copy of our new, free, full-color catalog. Or mail the coupon below.



130 items in full color.
All styles, all types.

- ceiling pieces
- wall brackets
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See your Virden distributor or mail the coupon today!

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(Continued on page 122)

TWO QUESTIONS:

1. Who'll throw out the first baseball at Griffith Stadium in 1962?

2. How many fluorescent lamps (installed this month) will your customers throw out by opening day, 1962?

As for question number one, traditionally the President opens the baseball season in Washington by tossing out the first ball. Who he'll be, we don't know. Sorry!

But we *do* know something about question number two. If a customer installs General Electric Fluorescents this month, *about 99% of them will still be going strong when the 1962 season opens!* That's because G-E Lamps are built and tested to give far fewer early burnouts. Records show that, on the average, G-E Lamp users will have between 1-2% burnouts after two years of single shift, or daytime, service. So, there are fewer work interruptions, fewer expensive, one-at-a-time lamp replacements. And the lighting level stays higher, longer because of G-E improvements.

G-E Lamps can save your customers money. Whether they use 40-watt, high output or slimlines, there's a G-E Money Saver Lamp that's just right for the job. And even bigger savings if they install a new system with G-E Power Groove® Lamps—the most powerful fluorescent they can buy. Ask your G-E Lamp representative for expert lighting advice—or write: General Electric Co., Large Lamp Dept. C-017, Nela Park, Cleveland 12, Ohio.

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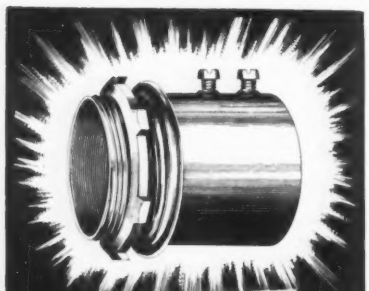
E·T·P exclusive pre-set staked screw with deep slotted head makes working easy—even in the tightest areas. There is **no backing out** when inserting conduit.



CONCRETE TIGHT! One piece, solid tubular steel—cannot open or spread. Available in all sizes from ½" to 2".

Connect with ETP for Economy

Samples and Brochure on Request.

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DEfender 5-8000

(Continued from page 120)

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San Francisco:
C. E. Ingalls & Sons ..... GArfield 1-2916
Seattle: Eicher & Co. ..... ATwater 4-1811
Salt Lake City: Cline Equip. Co. ..... ELgin 5-3814
Phoenix: W. H. Eddy Elec. Prod. Inc. ..... CRestwood 4-4032
Denver: I-T-E Circuit Breaker Co. ..... AMherst 6-1404
Butte: R. E. McDonough ..... Butte 2-5447

Killark Electric Mfg. Co. **21**
San Francisco: F. M. Nicholas ..... YUkon 2-1964
Los Angeles: Kenneth Anderson Co. ..... ANgelus 8-6771
Seattle: Northwestern Agencies, Inc. ..... MAine 3-8882
Denver: Kenneth B. Schumann Co. ..... AComa 2-8913
Phoenix: Kenneth B. Schumann Co. ..... AMherst 5-2863

Klein & Sons, Mathias **44**
Glendale, Calif. ..... CItrus 3-3523
Sunnyvale, Calif. ..... CHestnut 5-2310

KPF Electric Co. **98, 99**
Stockton, Calif. ..... HOward 4-8381

Kuhlman Electric Co. ..... **2nd cover**
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Seattle ..... MAin 4-2368
Portland ..... CApitol 8-4173
Phoenix ..... ALpine 2-5858
Spokane ..... MAdison 4-3285
San Diego ..... JU 2-6749
Denver: Sales Engineers ..... AComa 2-4893
Salt Lake City: Sales Engineers HUnter 5-3547

Line Material Industries **3**
San Francisco ..... PLaza 5-8600
Los Angeles ..... RAymond 3-6251
Portland ..... CApitol 2-1981
Seattle ..... ATwater 3-6368
Spokane ..... KEystone 5-2461
Salt Lake City ..... ELgin 5-6257
Phoenix: J. E. Redmond Supply ..... ALpine 4-8471
Boise ..... Phone: 2-5706
Butte ..... Phone: 8340
Denver ..... FL 5-1689 and 1680
Sacramento, Calif. ..... GI 2-6264
Anchorage (Spenard) Alaska ..... FA 2-2649

Marcus Transformer Co. Inc. **117**
San Francisco: E. B. Cook Co. UNderhill 1-2621
Los Angeles: Pacific Industries ..... WEbster 3-0335
Seattle: N. R. Schultz Co. ..... SEneca 6-6369
Denver: R & M Sales Co. ..... SPruce 7-2515
Albuquerque: McGillan Sales Co. ..... ALbuquerque 5-5239

Markel Electric Products, Inc. **28**
San Mateo, Calif. ..... FIreside 5-1496
Los Angeles: O. W. Coombs ..... RIchmond 7-0603
Portland: Pacific Elec. Sales ..... BElmont 5-4137
Phoenix: Wm. Benndorf ..... CR 7-1662

Mason Co., L. E. ..... **3rd Cover**
San Francisco: G. M. Howard & Assoc. ..... MArket 1-6759
Los Angeles:
John M. Fincke Co. ..... CApitol 5-4226
Portland:
Pacific Electric Sales Co. ..... BElmont 5-4137
Denver:
Harry F. Ream Sales Agency ..... CHerry 4-0558

Moe Light (See Thomas Ind., Lighting Div.)

Moloney Electric Co. **94, 95**
Garland Affolter in following cities:
San Francisco ..... EXbrook 7-1800
Los Angeles ..... MAdison 4-1864
Portland ..... CApitol 3-7349
Seattle ..... MUtual 2-4950
Denver: Hamilton Associates ..... CHerry 4-1505
Salt Lake: Riter Engineering ..... EMpire 3-7933

Murray Mfg. Corp. **45**
Los Angeles ..... MAdison 5-1396
San Francisco: Ernst F. Hauch ..... HEmlock 1-1828
Denver: Gaer Sales ..... AL 5-7310
Portland: Northwest Sales Co. ..... CApitol 3-5959
Phoenix: Jack Murphy Co.
San Diego: Jack Murphy Co. ..... BElmont 3-7078

National Supply Co.,
Tubular Products Div. **96**
San Francisco, Branch office ..... DOuglas 2-2975
San Francisco: Arthur & Allen ..... YUkon 2-3483
Los Angeles: Murphy-Hain ..... ANgelus 8-3521
Denver: Fred E. Staible & Sons ..... TAbor 5-3991
Salt Lake City:
Fred E. Staible & Sons ..... INgersol 6-2461
Seattle: J. H. Stumph ..... MUtual 2-5232

Ohio Brass Co. **47**
San Francisco ..... SUtter 1-5060
Los Angeles ..... MAdison 4-8555
Seattle ..... MAin 2-3842
Denver ..... SKyline 6-7722

Orangeburg Mfg. Co. Inc. **40**
General Electric Supply and Graybar Electric Co. all principal cities
Santa Ana ..... Lincoln 4-1195
Seattle ..... MUtual 2-4566
Newark, Calif. ..... SYcamore 3-2200

OZ Electrical Mfg. Co. **60**
San Francisco:
Eichorn & Melchior ..... DOuglas 2-1038
Los Angeles: Agencies Co. ..... MAdison 6-5443
Denver:
Harry F. Ream Sales Agency ..... CHerry 4-0558
Portland:
Wm. A. Proby Associates ..... CApitol 8-7261
Seattle: Wm. A. Proby Associates ..... MAin 3-3483

Pacific Gas and Electric Co. **52**
San Francisco ..... SUtter 1-4211

Pennsylvania Transformer Div. **54**
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: John G. Corrin ..... **MAdison 2-0830**
Seattle: Fred W. Carlson ..... ATwater 4-4630
Phoenix: Roy E. Coulson ..... Windsor 3-8935
Denver: Peterson Co. ..... DExter 3-5434
Salt Lake City: Clarence W. Silver ..... ELgin 5-5378
Portland:
Fred W. Carlson & Associates ..... CApitol 8-3798
Boise, Ida.: Clarence W. Silver Co. 2-6947
Albuquerque:
Williamson Sales Co. ..... ALpine 6-6617

Petersen Engineering Co. **20**
(Contact factory for nearest dealer)
Santa Clara, Calif. ..... AX 6-7712

Porta House **118**
Oakland ..... OLympic 2-7237
Sacramento: Robert Cronin ..... GIlbert 3-8543
Portland: Bardi Gen. Contractors ..... PRospect 5-4354
Los Angeles: Constructors Supply Co. ..... LUdlow 3-4158
Los Angeles: Ball & Black ..... ANgelus 9-7586
Santa Ana: Blystone Equip. Co. KImberly 2-3918

P-W Industries, Inc. **14**
Los Angeles: Calrepco ..... RIchmond 9-8485
San Francisco:
Oliver B. Lyman & Co. ..... SUtter 1-6440
Seattle: Fred W. Carlson Co. ..... AT 4-4630
Portland: Fred W. Carlson Co. ..... CA 8-3798
Denver:
Denver: Landes, Zachary & Peterson Co. ..... SHerman 4-1311
Salt Lake: Elec'l Sales Co. ..... HUnter 5-0531
Albuquerque: Technical Service Co. CH 7-1508

Ripley Co. **123**
Portland: Wm. J. Cottrell ..... CApitol 7-6191
Phoenix: W. H. Eddy ..... ALpine 2-6322
Oakland: J. H. Ormond Co. ..... TWinoaks 3-3235
Los Angeles: A. W. Nash Co. ..... ANgelus 9-7304

Rome Cable Div. of Alcoa **4**
Los Angeles ..... RAymond 3-3631
San Francisco ..... VAlencia 6-3580
Seattle ..... MAdison 4-3017
Salt Lake City ..... ELgin 9-8811
Denver ..... KEystone 4-0533

Royal Electric Corp. **17**
Los Angeles: Eckert-Lloyd Co. ..... RIchmond 7-9655
San Francisco: Eckert-Lloyd Co. ..... HEmlock 1-5792
Seattle: Northwestern Agencies ..... MAin 3-8882
Portland: Northwestern Agencies ..... CApitol 7-0434
Phoenix: Wm. Benndorf ..... CRestwood 7-1662
Denver: Hyde Electronics Co. ..... WEst 6-3456

Sangamo Electric Co. **124**
San Francisco: L. A. Nott ..... HEmlock 1-4738
Los Angeles: (Factory Sales) ..... DUnkirk 7-2336
(Time Switches) ..... ANgelus 8-6771
Seattle: T. R. Wood ..... MAin 3-8204
Denver: Mt. States Machinery ..... CHerry 4-7421
Phoenix: J. E. Redmond Co. ..... ALpine 4-8471
Portland: R. L. Schoenberger ..... CApitol 3-8742
Butte: R. E. McDonough ..... Butte 2-5447
Tucson ..... AXtel 8-4801
Albuquerque:
Gorman Engineering ..... CHapel 7-1596
El Paso: Gorman Engineering ..... KEystone 2-3449

(Continued on page 123)

FORM 110
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Continued from page 122

Southern States Equipment Corp. 110
Seattle: Jos. C. Platt — MAin 3-6141
Salt Lake City: H. Lee Rawlings Co. — ELgin 9-8811
Denver: R. T. Lewis Co. — EAst 2-1082
Los Angeles: W. E. Kirk Co — MAdison 4-3651
Lake Grove, Ore.: C. F. Selby — NEptune 6-1486
Oakland: John H. Ormond — TWinoaks 3-3235

Smoot-Holman Co. 22
San Francisco — MArket 1-8474
Los Angeles — ORegon 8-8981
Salt Lake City: J. R. Christensen — EMpire 3-4419
Seattle: F. C. Scharr — ATwater 2-9230
Portland: Clay Barton — CApitol 8-3520

Southern California Edison Co. 64
Los Angeles — MAdison 4-7111

Southern Electrical Co. 15
Garland-Affolter Eng. Co. in following cities:
San Francisco — EXbrook 7-1800
Los Angeles — MAdison 4-1864
Portland — CApitol 3-7349
Seattle — MUtual 2-4950
Denver: Hamilton Associates — CHerry 4-1505
Phoenix: R. E. Coulson Co. — WIndsor 3-8935

Square D Co. 66
Los Angeles — CApitol 1-1171
San Francisco — JUniper 7-4590
Seattle — EAst 3-1474
Portland — BElmont 4-8488
Denver — KEystone 4-6234
Salt Lake City — DAvis 2-5859
Phoenix — ALpine 8-6448
El Paso — KEystone 3-0544
Spokane — FAirfax 8-3690
San Diego — BElmont 3-7621
Fresno — AMherst 8-6268

Standard Oil Co. of Calif. 30
San Francisco — SUtter 1-7700
Los Angeles — MAdison 4-2711
Portland — CApitol 3-4161
Seattle — MAin 3-6310
Salt Lake City — DAvis 2-5831

Thomas Industries, Inc.
Lighting Fixture Div. 55
Burlingame, Calif. — OXford 7-1036
Los Angeles — OVerbrook 5-8050
Salt Lake City — ELgin 5-2322
Portland — CHerry 4-7214
Bellevue, Wash. — ELgin 1-6617
Spokane — FAirfax 7-3278

Turner Electric Corp. 118
Fred W. Carlson in following cities
Seattle — ATwater 4-4630
Portland — CApitol 8-3798
Butte — Phone 8916
Los Angeles:
Industrial Eng. & Equip. Corp. — DUnkirk 1-1281
Denver: Hamilton Associates — CHerry 4-1505

Virden Lighting,
Division of John C. Virden Co. 119
Atherton, Calif.: W. G. Sawyer — BAvenport 5-4931
Fullerton: Wm. K. Newell — TRojan 1-1845
Phoenix: Ray E. Wendling — ALpine 2-2541
Seattle: Donald S. Gleason — LAkeview 5-5151
Portland: Clyde E. Dodd — BUtler 5-3271

Wagner Electric Corp. 42, 43
South San Francisco — PLaza 6-0520
El Segundo, Calif. — ORegon 8-7671
Portland — CApitol 7-3654
Salt Lake City — EMpire 3-5013
Denver — CHerry 4-7421
Seattle — MAin 2-2342

Walker Brothers 109
Garnett Young & Co. in following cities:
San Francisco — DOuglas 2-4220
Los Angeles — ADams 1-4337
Seattle — MAin 3-0123
Portland — CApitol 8-8478
Phoenix — CRestwood 4-5483
Denver: Kenneth B. Schuman — AComa 2-8913

Weld Rite Co. 57
Oakland — ANdover 1-3341
Los Angeles — MAdison 4-9338

Westinghouse Electric Corp.
..... 33, 34, 35, 36, 112, 113
San Francisco — EXbrook 2-5353
Los Angeles — MAdison 6-3881
Denver — KEystone 4-8121
Phoenix — ALpine 8-8621
Salt Lake City — ELgin 5-3413
Seattle — MAin 2-0808
Portland — CApitol 2-9151
Spokane — FAirfax 8-3371

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	Continuous Capacity (Amps)	200	150	175	150
	Least Switchboard Space	Yes	No	No	No
DESIGN	Number of Disks	1	2	2	3
	Smallest Size	Yes	No	No	No
	Minimum Weight	9 lbs	17 lbs	18 lbs	12 lbs
TESTING	Number of Adjustments	8	10	11	12
	All Micrometer Adjustments	Yes	No	Yes	No
	Easiest to Test	Yes	No	No	No
ACCURACY	Disk Speed (Rpm.)	8⅓	30	16⅔	30
	Lowest Starting Watts	Yes	No	No	No
MAINTENANCE	Sectionalized Construction	Yes	No	No	No
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